Installing and Operating BayStack ARN Routers

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About This Guide

If you are responsible for installing, starting, and operating a BayStack™ Advanced Remote Node™ (ARN™) router, you need to read this guide.

If you want to	Go to
Physically install the ARN and attach communications equipment	Chapter 1
Connect the ARN to the network and start it up using one of the software startup options	Chapter 2
Operate ARN switches and interpret LED displays	Chapter 3
Install a WAN adapter module upgrade	Chapter 4
Configure the ARN for Netboot or Directed Netboot	Appendix A
Use Local Boot (the Quick-Start procedure)	Appendix B
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Although this guide describes how to use Site Manager to manage the ARN, you can now use the Bay Command Console (BCC™) to configure most protocols on ARN routers. For information about using the BCC to configure the ARN, see *Using the Bay Command Console*.

Before You Begin

Before installing the ARN, ensure that all network wiring has been installed on the premises using standard cable-system practices.

Before turning on the ARN for the first time, contact your network administrator to determine which software configuration option to use.

Conventions

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: if command syntax is **ping** *<ip_address>*, you enter **ping 192.32.10.12**
bold text	Indicates text that you need to enter command names in text. Example: Use the **dinfo** command.
brackets ([ ])	Indicate optional elements. You can choose none, one, or all of the options.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu. Example: Pin 7 > 19 > 20
`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes** | **nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

ANSI	American National Standards Institute
AUI	Attachment Unit Interface
BootP	Bootstrap Protocol
BRI	Basic Rate Interface
CCITT	International Telegraph and Telephone Consultative Committee (now ITU-T)
CHAP	challenge handshake authentication protocol
CSMA/CD	carrier sense multiple access with collision detection
CSU	channel service unit
CTS	clear to send
DCD	data carrier detect
DCE	data communications equipment
DCM	Data Collection Module
DLCMI	Data Link Control Management Interface
DSR	data set ready
DSU	data service unit
DTE	data terminal equipment
DTR	data terminal ready
EIA	Electronic Industries Association
FDL	facility data link
HDLC	high-level data link control
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU-T	International Telecommunications Union–Telecommunications
LAN	local area network
LED	light-emitting diode
LQR	link quality reporting
MAU	media access unit
NBMA	nonbroadcast multi-access
NEMA	National Electrical Manufacturers Association

NVFS	nonvolatile file system
OCU	office channel unit
OSPF	Open Shortest Path First (Protocol)
PAD	packet assembler/disassembler
PAP	password authentication protocol
PCMCIA	Personal Computer Memory Card International Association
PPP	point to point protocol
PVC	permanent virtual circuit
RIP	Routing Information Protocol
RLSD	received line signal detection
RMON	remote monitoring
RTS	request to send
SMDS	switched multimegabit data service
SNMP	Simple Network Management Protocol
STP	shielded twisted-pair
SQE	signal quality error
TCP/IP	Transmission Control Protocol/Internet Protocol
TNV	telecommunications network voltage
UTP	unshielded twisted-pair
WAN	wide area network

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Region	Telephone number	Fax number
United States and Canada	800-2LANWAN; then enter Express Routing Code (ERC) 290, when prompted, to purchase or renew a service contract 978-916-8880 (direct)	978-916-3514
Europe	33-4-92-96-69-66	33-4-92-96-69-96
Asia/Pacific	61-2-9927-8888	61-2-9927-8899
Latin America	561-988-7661	561-988-7550

Information about customer service is also available on the World Wide Web at *support.baynetworks.com*.

How to Get Help

If you purchased a service contract for your Bay Networks product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

If you purchased a Bay Networks service program, call one of the following Bay Networks Technical Solutions Centers:

Technical Solutions Center	Telephone number	Fax number
Billerica, MA	800-2LANWAN	978-916-3514
Santa Clara, CA	800-2LANWAN	408-495-1188
Valbonne, France	33-4-92-96-69-68	33-4-92-96-69-98
Sydney, Australia	61-2-9927-8800	61-2-9927-8811
Tokyo, Japan	81-3-5402-0180	81-3-5402-0173

Bay Networks Educational Services

Through Bay Networks Educational Services, you can attend classes and purchase CDs, videos, and computer-based training programs about Bay Networks products. Training programs can take place at your site or at a Bay Networks location. For more information about training programs, call one of the following numbers:

Region	Telephone number
United States and Canada	800-2LANWAN; then enter Express Routing Code (ERC) 282 when prompted 978-916-3460 (direct)
Europe, Middle East, and Africa	33-4-92-96-15-83
Asia/Pacific	61-2-9927-8822
Tokyo and Japan	81-3-5402-7041

Chapter 1
Installing the ARN

This chapter describes how to install the BayStack ARN router, as follows:

Topic	Page
Preparing to install the ARN	1-2
Installing the ARN	1-5
Understanding the ARN module locations	1-9
Connecting communications cables	1-10
Connecting a management console	1-25
Connecting back-panel modem interfaces	1-29
Connecting the power cables	1-32
Installing the flash memory card	1-33
Where to go next	1-34

Note: The installation instructions in this chapter assume that wiring is already installed on the premises using common cable system practices. Your installation procedure may differ slightly, depending on your cable system.

Preparing to Install the ARN

Verify the following before beginning the installation, as explained in the sections that follow:

- Your shipment is complete and undamaged.
- You have the proper equipment and tools.
- Your installation site meets physical, electrical, and environmental requirements.
- You have the communications devices and the cabling that you need to attach to the ARN.

Verifying Shipment Contents

You should inspect all items for shipping damage. If you detect any damage, do not install the ARN. Call the Bay Networks Technical Solutions Center in your area, as described in "How to Get Help."

In addition to the ARN and this guide, your shipping container should contain several other hardware accessory items. Verify that the items in the shipping container match those on the packing list affixed to the shipping container.

Refer to the following checklist when verifying the contents of the shipping container:

__ One **power cable** for connecting the ARN to a wall outlet.

__ One **console/modem cable kit** (Order No. 110310) for connecting an optional local console or modem. The console/modem cable kit contains one 15-foot AT standard molded serial cable (with DB-9 receptacle to DB-25 plug connectors) and one null modem crossover adapter (with DB-25 to DB-25 receptacle connectors).

__ Two **flange brackets,** eight **#6 Phillips screws,** four **#10 cagenut screws** and **washers,** and four **cage nuts** for rack-mounting the ARN.

___Four **rubber feet** for table-top operation.

Figure 1-1 illustrates the ARN hardware accessory items.

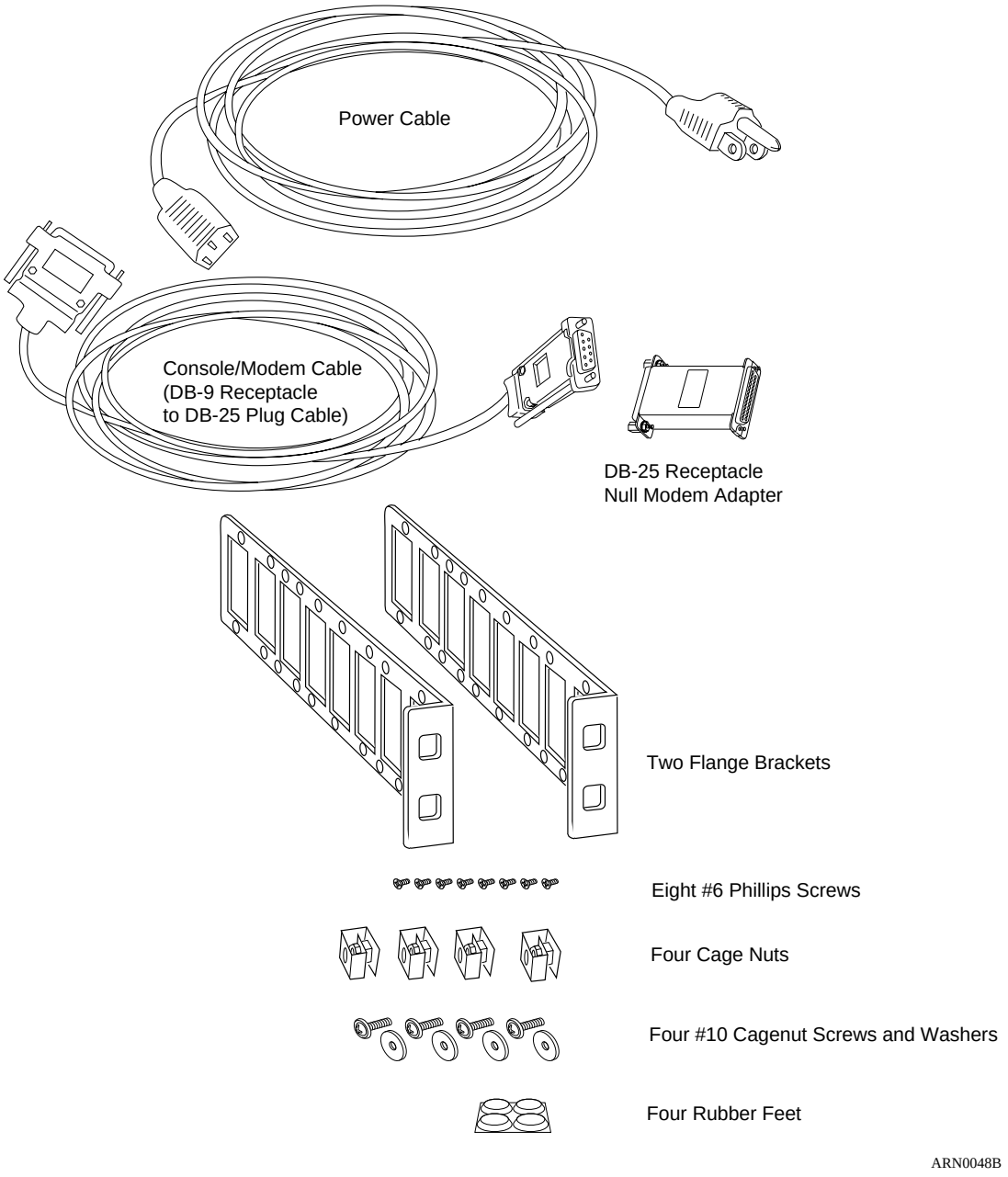


Figure 1-1. Accessories in the ARN Shipping Container

Additional Equipment

To install the ARN, you may need some additional items that are not part of the ARN accessory package. Before installing the ARN hardware, ensure that you obtain all the cables, tools, and other equipment that you need.

Cables

Unless they were specifically ordered, the *cables necessary for your network* configuration are not part of the ARN accessory package. If you do not have the proper cables, contact your network administrator or see the *Cable Guide.*

Management Console

You can attach an optional computer terminal or PC as a *console* to the ARN to monitor the results of startup diagnostics and perform manual boot configurations. Or you can attach any AT-compatible modem to allow remote dial-in access to diagnostics and configuration.

Note: To use the Netboot, Directed Netboot, or Local Boot options for booting and configuring the ARN (see Chapter 3, “Operating the ARN”), you must have a local terminal connected the first time the ARN powers up.

Mounting Hardware

To rack-mount the ARN, you need a *Phillips screwdriver* and an electronic *enclosure rack* that meets the following specifications:

- Heavy-duty steel construction
- Electronic Industries Association (EIA) standard hole-spacing
- Width of 19 in. (48.26 cm) and depth of 24 in. (60.96 cm)

If the rack does not have threaded rail holes, you must use cage nuts (see Figure 1-1) to use with the cagenut screws.

Verifying Site Requirements

The installation site must provide a certain amount of free space around the ARN to dissipate heat, as detailed in Table 1-1.

Table 1-1. Installation Space Requirements

Width	Depth (minimum)	Depth (for servicing)
22.5 in. (57.2 cm)	15 in. (38.1 cm)	25 in. (63.5 cm)

In addition, the installation site must meet the electrical and environmental specifications listed in Appendix C.

Caution: You must use grounded electrical power outlets with the ARN.

Installing the ARN

Once you are ready to install the ARN in its final location, you have two options:

- Position the ARN on a flat, sturdy, horizontal surface.
- Mount the ARN in an electronic enclosure rack.

Positioning the ARN on a Flat Surface

When positioning the ARN on a flat surface, make sure that the surface is:

- Large enough for the ARN to operate properly (Table 1-1)
- Sturdy enough to support the combined weight of the ARN and any cables that you connect

You should place the self-adhesive, rubber feet (shipped with the ARN) on the bottom of the ARN chassis. These feet not only protect the surface on which you position the ARN, they provide added friction against the weight of any cables that you attach to the device.

Rack-Mounting the ARN

For this procedure, you need:

- Two flange brackets and eight #6 Phillips screws (shipped with the ARN)
- A Phillips screwdriver
- An electronic enclosure rack. If the rack does not have threaded rail holes, you must attach the four cage nuts shipped with the ARN.
- Four #10 cagenut screws and washers (shipped with the ARN)

To rack-mount the ARN:

1. **Determine how you want the ARN to fit in the equipment rack.**

   Multiple holes in the flange brackets provide several options for rack-mounting the ARN. How you attach the flange brackets determines how far the router extends outside or remains inside the rack. Figure 1-2 shows three of the most common locations for the brackets.

2. **Attach a flange bracket to each side of the ARN.**

   a. **Align four bracket holes with four holes in the ARN enclosure (Figure 1-2).**

   b. **Insert a #6 Phillips screw through each hole and into the ARN.**

   c. **Tighten the four screws with a Phillips screwdriver.**

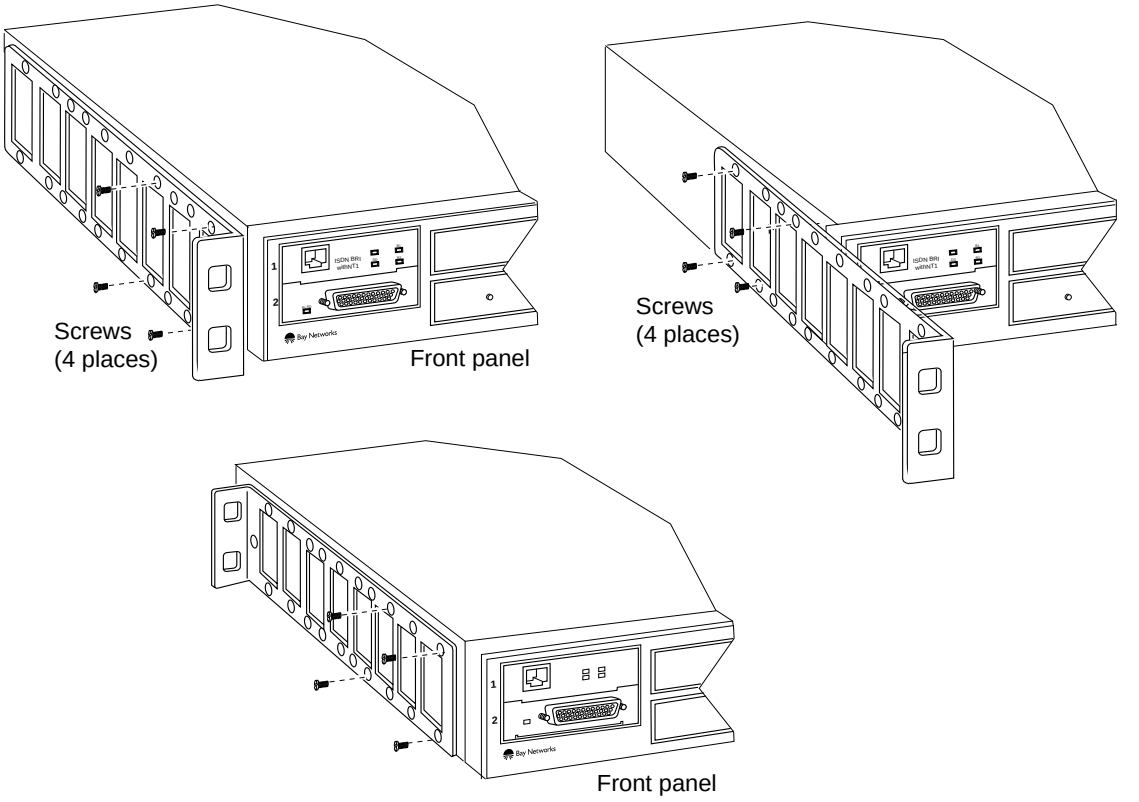


Figure 1-2. Options for Attaching Flange Brackets to Rack-Mount the ARN

3. **If the holes in the rack's vertical supports are not threaded for cagenut screws, insert a cage nut in four locations (Figure 1-3).**

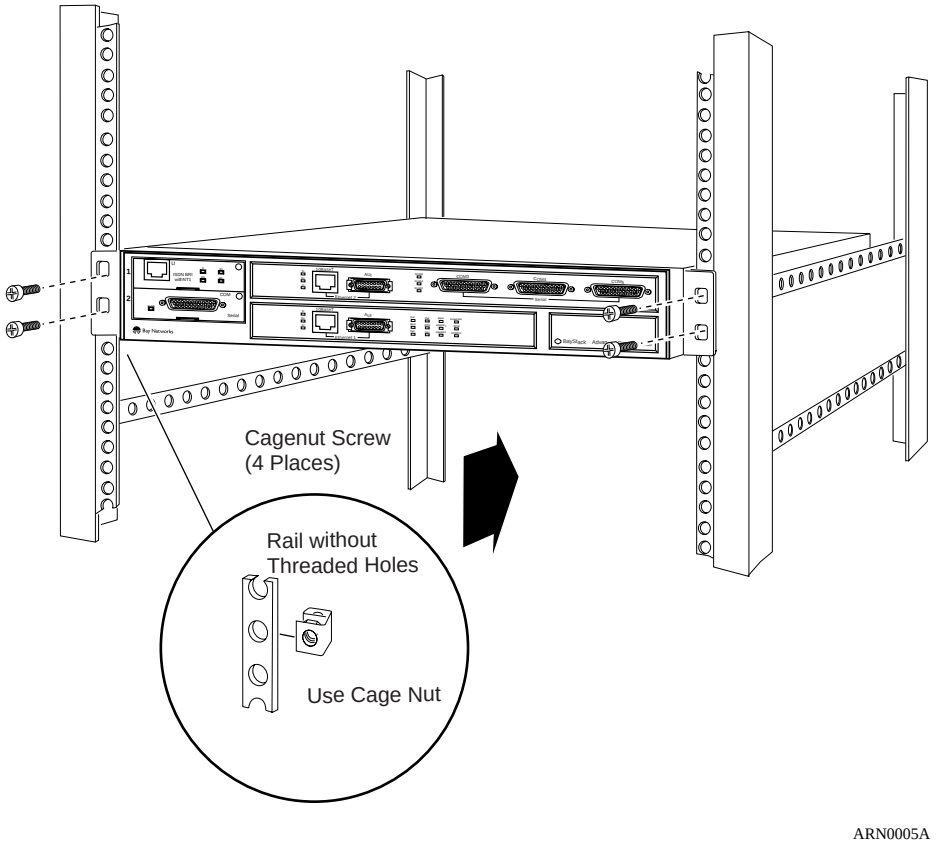


Figure 1-3. Installing the ARN in an Electronic Enclosure Rack

4. **Insert a cagenut screw through each bracket hole and into the corresponding holes in the rack.**
5. **Tighten each cagenut screw with a Phillips screwdriver.**

Understanding the ARN Module Locations

The ARN is designed to scale to your needs. In addition to either an Ethernet or token ring base module, the ARN can contain an optional LAN expansion module and up to two WAN adapter modules (Figure 1-4).

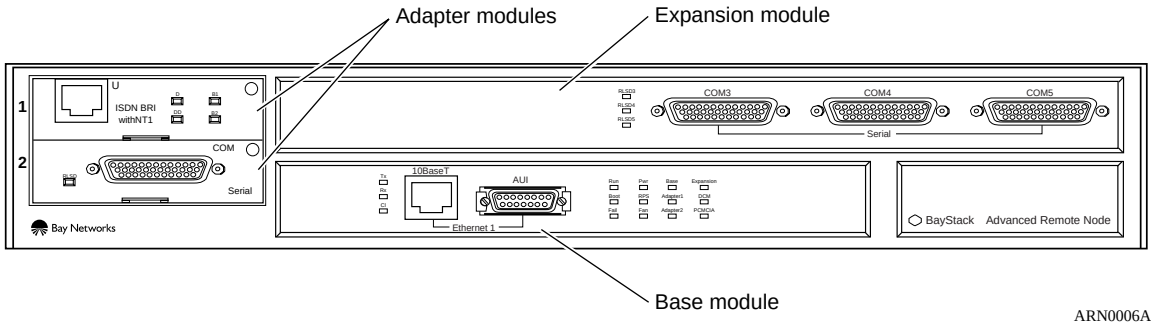


Figure 1-4. ARN Module Locations

The ARN is available in the following base module configurations:

- One Ethernet AUI and Ethernet 10BASE-T interface
- One Ethernet 10/100BASE-Tx interface
- One Ethernet 100BASE-Fx interface
- One Token Ring interface (STP only)

ARN expansion modules provide additional Ethernet (AUI and 10BASE-T), token ring (STP and UTP), and serial interfaces. Each ARN WAN adapter module adds one serial, ISDN BRI, V.34 modem, T1/FT1, E1/ET1, 56/64K DSU/CSU, or X.25 PAD interface.

The Ethernet base and expansion modules can also contain an optional data collection module (DCM). This optional DCM gathers Ethernet statistics for a remote monitoring (RMON) utility. A subset of these statistics is gathered with a built-in RMON function on the Ethernet10/100BASE-Tx and -Fx interfaces. See *Configuring RMON and RMON2 on BayRS Routers* for information about how to enable and use each RMON data collection implementation.

Connecting Communications Cables

Gather the communications equipment and cabling that you will attach to the ARN. If you do not have the proper cables, contact your network administrator or see the *Cable Guide*.

Note: For cable interface descriptions, see Appendix C.

Then, complete the steps in the applicable sections:

- "Connecting to an Ethernet Interface" on page 1-10
- "Connecting to a Token Ring Interface" on page 1-14
- "Connecting to a Serial Interface" on page 1-16
- "Connecting to the ISDN Interface" on page 1-18
- "Connecting to the 56/64K DSU/CSU Interface" on page 1-19
- "Connecting to the FT1/T1 DSU/CSU Interface" on page 1-20
- "Connecting to the E1/FE1 DSU/CSU Interface" on page 1-21
- "Connecting to the X.25 PAD Interface" on page 1-24

Connecting to an Ethernet Interface

You can connect an Ethernet cable to any ARN base or expansion module that contains an Ethernet interface option.

Note: On Ethernet modules that offer two interface types -- an attachment unit interface (AUI) transceiver interface or a UTP interface -- you can only use one interface at a time. For example, you can connect to either the AUI transceiver interface or the 10BASE-T UTP interface on the base module, but you cannot use both interfaces at the same time.

Connecting to the AUI

The AUI interface provides broadband, baseband, fiber, and shielded twisted pair (STP) support, depending on the transceiver and cables you use.

Caution: Connecting the ARN AUI interface directly to the AUI interface on an Ethernet station violates IEEE 802.3 standards. The AUI interface is designed only for connection to a transceiver.

To attach an Ethernet AUI transceiver (*drop*) cable to the AUI connector on an Ethernet module:

1. **Connect an Ethernet AUI drop cable to the interface labeled AUI (Figure 1-5).**

   The cable must have a 15-position D-SUB receptacle.

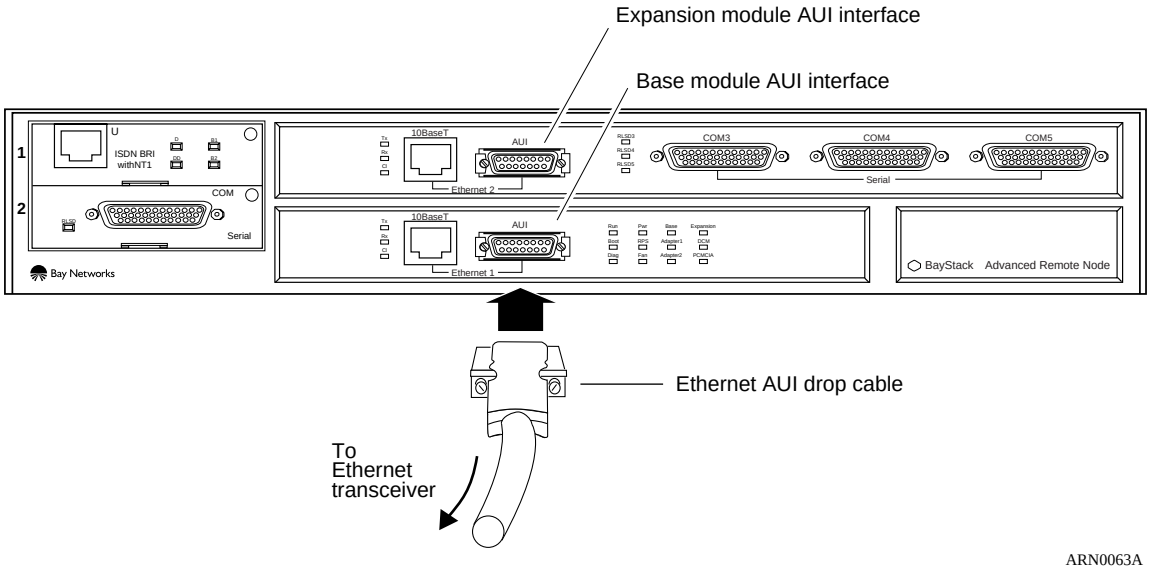


Figure 1-5. Connecting an AUI Cable

2. **Secure the AUI cable using the slide lock on the interface.**
3. **Connect the other end of the cable to an Ethernet transceiver.**

Connecting to the UTP Interface

To connect an unshielded twisted-pair (UTP) cable to the base module or expansion module Ethernet interface, insert the UTP jack into the RJ-45 receptacle connector, as shown in Figure 1-6 and Figure 1-7.

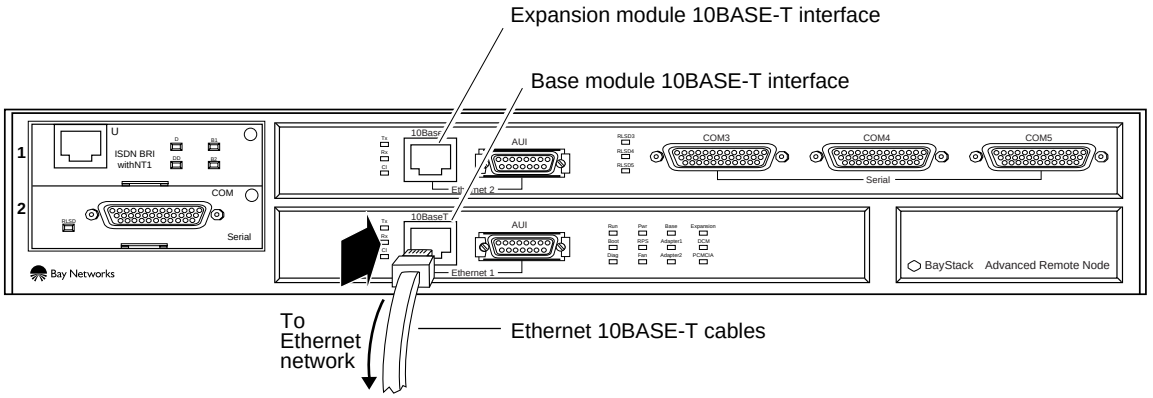


Figure 1-6. Connecting an Ethernet 10BASE-T Cable

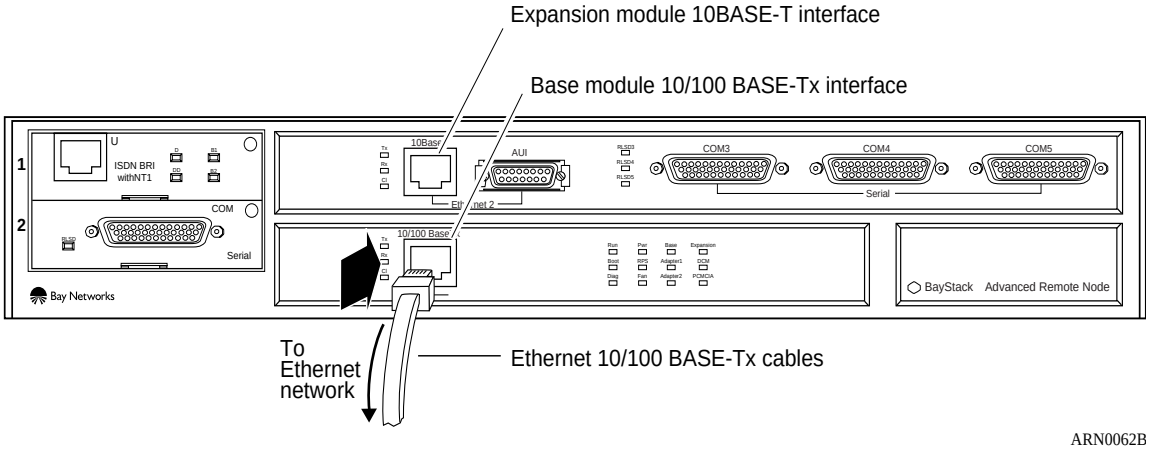


Figure 1-7. Connecting an Ethernet 10/100BASE-Tx Cable

Connecting to the Fiber Interface

To connect a fiber cable to the base module or expansion module Ethernet interface, insert the fiber cable jack into the interface as shown in Figure 1-8.

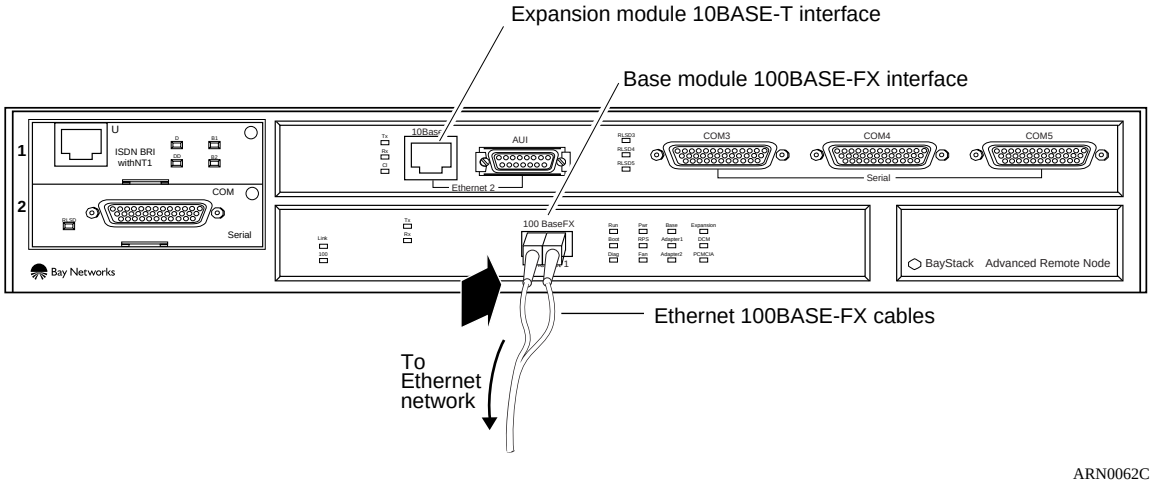


Figure 1-8. Connecting an Ethernet 100BASE-Fx Cable

Connecting to a Token Ring Interface

You can connect a token ring cable to any ARN base module or expansion module that contains a token ring interface option. Each of these interface options offers two token ring interface types: an STP interface or a UTP interface.

Note: You can use only one token ring interface on an ARN base or expansion module at any time. For example, you can connect to either the STP interface or the UTP interface on a base module, but you cannot use both interfaces at the same time.

Connecting to the STP Interface

To connect a token ring shielded twisted pair (STP) cable to the base module or expansion module token ring interface:

1. **Attach the 9-pin D-SUB plug to the token ring STP interface (Figure 1-9).**

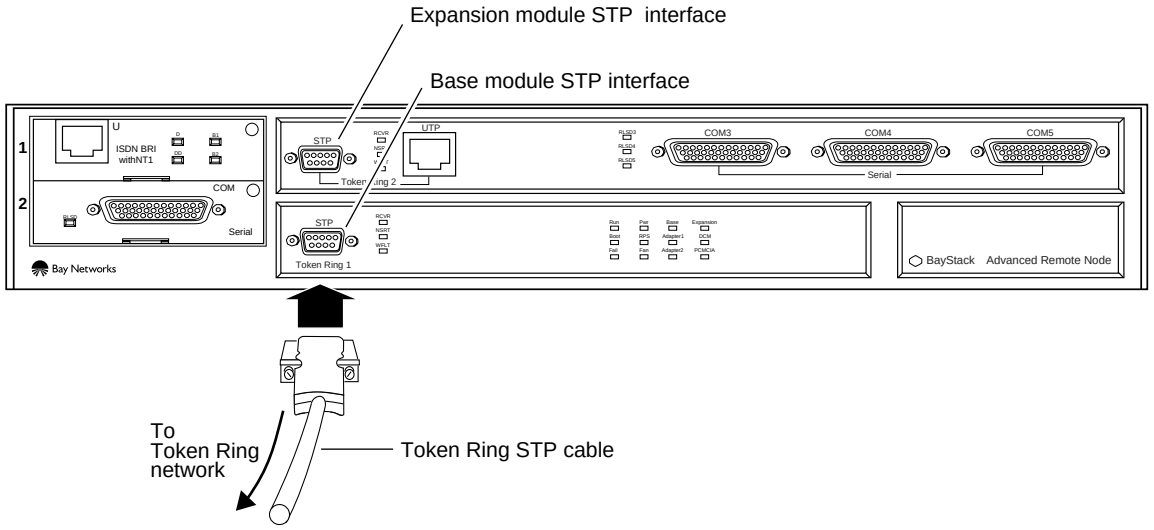


Figure 1-9. Connecting a Token Ring STP Cable

2. **Secure the token ring cable using the capture screws.**

Connecting to the UTP Interface

To connect a token ring UTP cable to the expansion module token ring interface, insert the RJ-45 connector into the UTP interface, as shown in Figure 1-10.

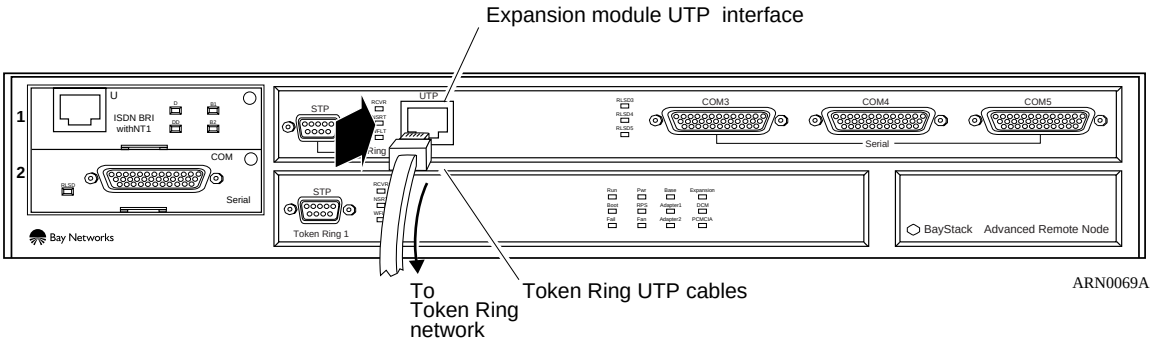


Figure 1-10. Connecting a Token Ring UTP Cable

Connecting to a Serial Interface

You connect 44-pin serial cables to the connectors on ARN adapter and expansion modules. Each serial interface supports multiple WAN protocols at a transmission rate of 1200 b/s to 2.048 Mb/s.

To connect to the serial interface:

1. **Locate the serial interface cable.**

   The serial interfaces automatically configure the desired electrical interface when used with standard keyed cables. For information about cables available from Bay Networks, see the *Cable Guide*.

Note: The *Cable Guide* refers to serial cables that transmit synchronous data as "synchronous" cables.

2. **Connect the cable to an expansion module serial interface (Figure 1-11) or an adapter module serial interface (Figure 1-12).**

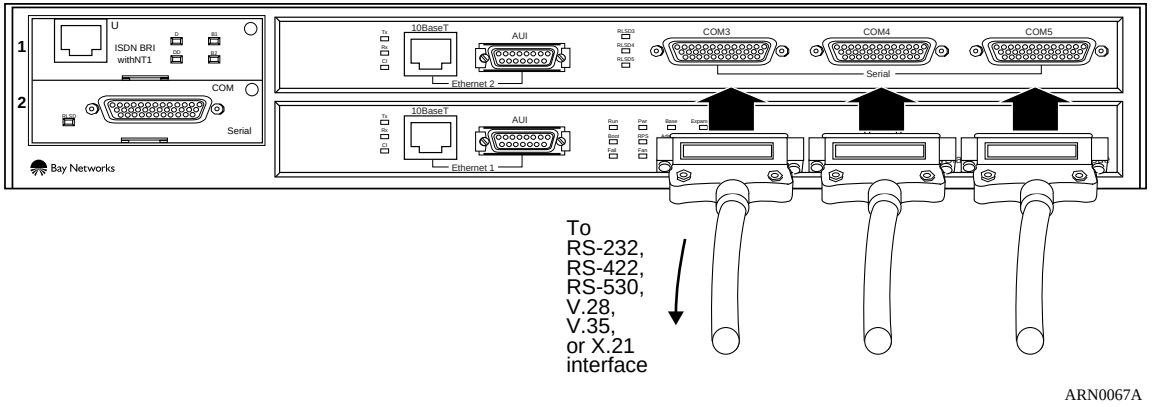


Figure 1-11. Connecting Serial Cables to an Expansion Module

Connector numbering on expansion module serial interfaces begin with COM3.

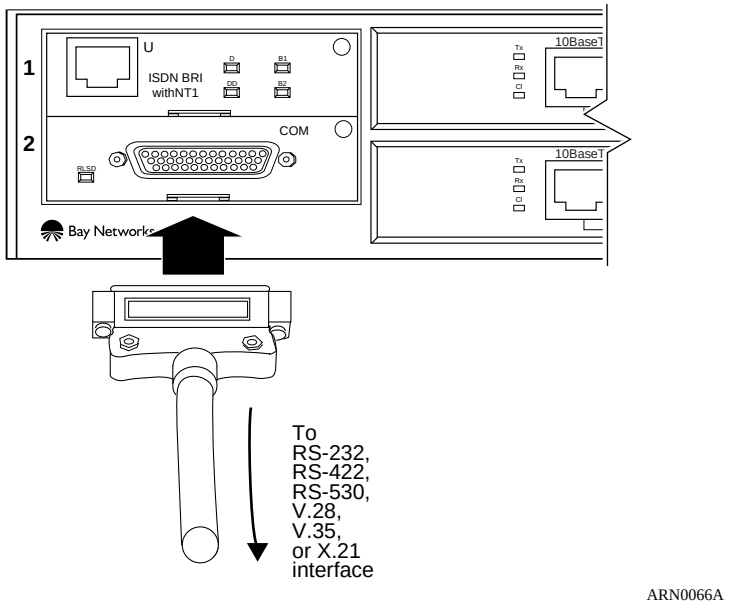


Figure 1-12. Connecting a Serial Cable to the Serial Adapter Module

Serial adapter modules, labeled COM, can be in position 1 or 2. These interfaces are COM1 and COM2.

3. **Secure the cable to the interface using the capture screws on the cable.**
4. **Connect the remote end of each cable to the appropriate communications equipment.**

Connecting to the ISDN Interface

You connect ISDN service to the connector on an installed ISDN BRI U or ISDN BRI S/T adapter module. Modules with an S/T interface provide dialup connection to the ISDN network through a terminal adapter. Modules with a U interface allow you to connect directly to the ISDN network switch.

The BRI provides two B channels, and supports full D-channel signaling and call setup/teardown as defined in 1988 CCITT (now ITU-T) Recommendation Q.921 and Q.931. For more information, refer to *Configuring Dial Services*.

To connect ISDN BRI services:

1. **Insert the ISDN cable into the ISDN BRI S/T or U interface (Figure 1-13).**

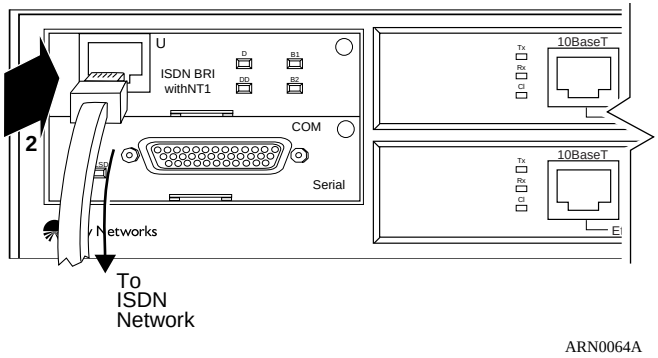


Figure 1-13. Connecting the ISDN BRI Cable

2. **Connect the other end of the cable to the ISDN communications device.**

Connecting to the 56/64K DSU/CSU Interface

You connect 56/64K DSU/CSU service to the connector on an installed 56/64K DSU/CSU adapter module.

To connect to the 56/64K DSU/CSU interface:

1. **Insert the 56/64K DSU/CSU cable connector into the DSU/CSU interface labeled DDS (Figure 1-14).**

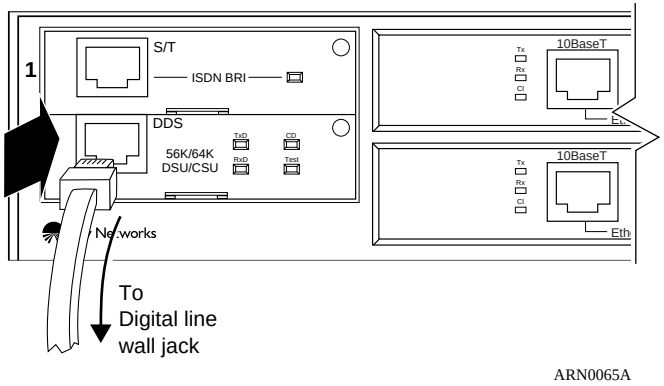


Figure 1-14. Connecting the 56/64K DSU/CSU Cable

2. **Connect the other end of the cable to a digital line (for example, a digital line wall jack that connects to an office channel unit [OCU]).**

Connecting to the FT1/T1 DSU/CSU Interface

You connect FT1/T1 DSU/CSU service to the connector on an installed FT1/T1 DSU/CSU adapter module.

To connect to the FT1/T1 DSU/CSU interface:

1. **Insert the RJ-48C cable connector into the FT1/T1 DSU/CSU interface on the adapter module (Figure 1-15).**

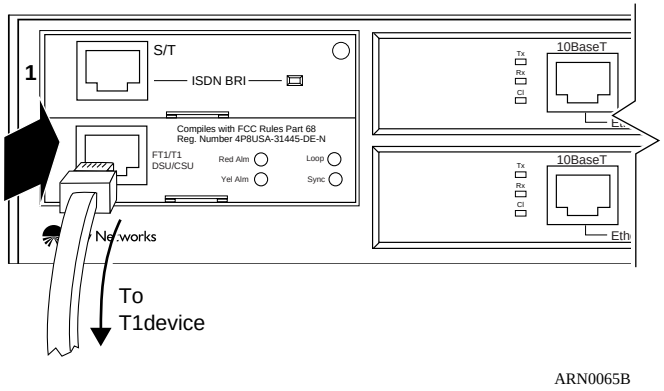


Figure 1-15. Connecting the FT1/T1 DSU/CSU Cable

2. **Connect the other end of the cable to a T1 communications device.**

Connecting to the E1/FE1 DSU/CSU Interface

You connect E1/FE1 service to the connector on an installed E1/FE1 adapter module.

To connect to the E1/FE1 interface:

1. **Insert the RJ-48C cable connector into the E1/FE1 interface (Figure 1-16).**

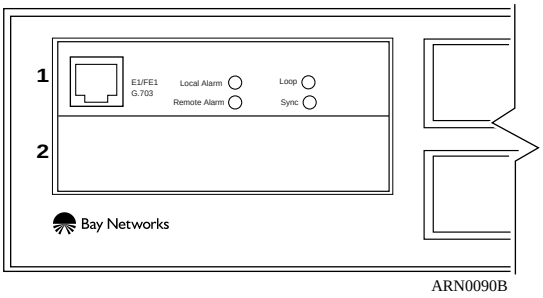


Figure 1-16. Connecting the E1/FE1 Cable

2. **Connect the other end of the cable to a FE1communications device.**

Connecting to the Integrated V.34 Modem

You connect dial services to the connector on an installed V.34 Modem adapter module.

To connect a telephone cable to the integrated V.34 modem:

1. **Connect the RJ-11 telephone cable to the V.34 modem interface (Table 1-17).**

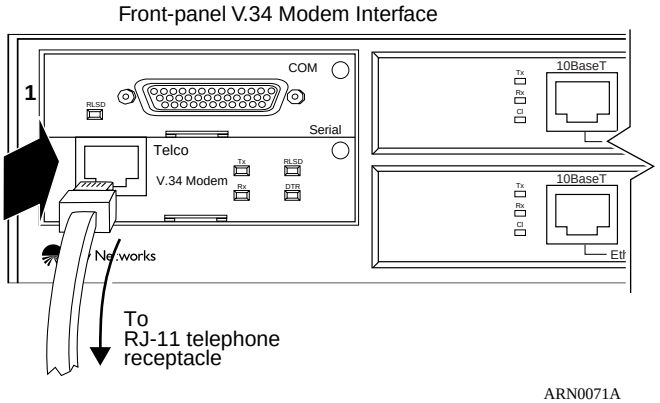


Figure 1-17. Connecting a Telephone Cable

2. **Connect the other end of the cable to an analog telephone line.**

Table 1-2 provides the default settings for the V.34 Modem adapter module.

Note: The default settings for the front-panel V.34 Modem adapter module differ from the default settings for the back-panel V.34 Console Modem module interface. For information about the back-panel V.34 Console Modem and its default settings, see “Connecting a Console Modem” on page 1-29.

Table 1-2. V.34 Front-Panel Modem Adapter Module Defaults

Modem Signal/Parameter	Default Value
Clear To Send (CTS)	On
Data Terminal Ready (DTR)	Depends on the modem type. Set the modem to answer incoming calls when DTR is active.
Data Carrier Detect (DCD) or received line signal detection (RLSD)	On while carrier is present (the ARN uses DCD to detect modem connect and disconnect).
Data Set Ready (DSR)	On
Ready to Send (RTS)	Ignore
Synchronous/Asynchronous Mode	Asynchronous
AutoAnswer	Set on *n* rings with DTR active (*n* must be greater than 0).
Local Character Echo	Off
Supervisory Functions	Off
Baud Rate	28800
Data Bits	8
Stop Bits	1
Parity	None

Connecting to the X.25 PAD Interface

To support X.25 PAD applications, the ARN router requires the following hardware:

- ARN X.25 PAD adapter module
- Breakout box

To connect X.25 PAD services:

1. **Position the X.25 breakout box above the ARN in one of the following ways:**
   - Attach the rubber feet that came in the shipping container to the four raised areas on the bottom of the breakout box chassis; then, place the box on top of the ARN (Figure 1-18).
   - Using the screw holes on the sides of the breakout box, install the box above the ARN in a standard equipment rack. For information about rack-mounting the ARN, see “Rack-Mounting the ARN” on page 1-6.
2. **Connect the DB-60 cable on the breakout box to the X.25 PAD connector on the installed module (Figure 1-18).**

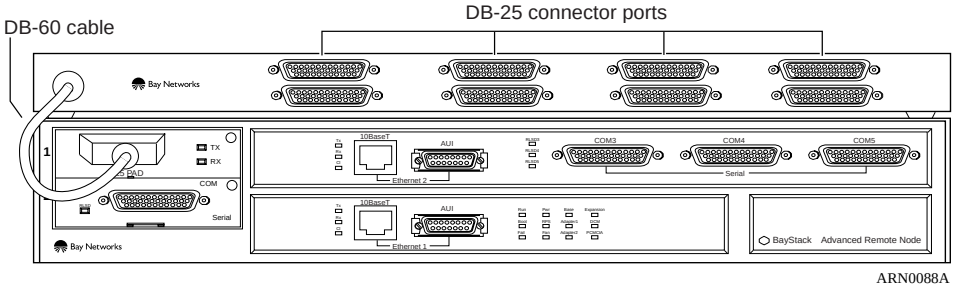


Figure 1-18. Connecting a Breakout Box to the X.25 PAD Interface

3. **Connect the appropriate WAN cabling to each of the eight DB-25 interfaces on the breakout box that you will use.**

   For information on cables available from Bay Networks, see the *Cable Guide*.

Connecting a Management Console

You can use the back-panel console ports to connect one or both of the following management devices:

- PC or terminal
- External modem or telephone connection to optional integrated V.34 modem

Using a local console, you can monitor the results of the ARN startup diagnostics and set the boot configuration. Using an attached modem, you can enable remote dial-in access for various management tasks.

Note: To use the Netboot, Directed Netboot, or Local Boot software configuration options described in Chapter 2, "Starting the ARN," you must connect a management console the first time you power up the ARN.

Connecting a PC Console

To connect a PC to the ARN, you need a standard AT serial cable with a 25-pin plug connector, plus these pieces from the ARN console/modem cable kit:

- Serial console/modem cable with 9-pin receptacle to 25-pin plug connectors (Order No. 110307)
- Null modem crossover adapter with two 25-pin receptacle connectors (Order No. 110308)

Once you have the correct equipment, complete the following steps:

1. **Configure the PC console, using the following parameters and instructions in your PC documentation.**
   - Baud rate 9600
   - 8 data bits
   - 1 stop bit
   - No parity
2. **Turn off the PC.**
3. **Insert the 9-pin receptacle end of the console cable into the ARN Console interface (Figure 1-21).**

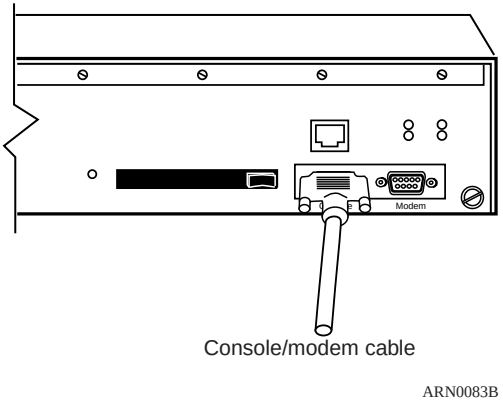


Figure 1-19. Connecting the Console/Modem Cable

4. **Attach the null modem crossover adapter to the other end of the console cable (Figure 1-20).**

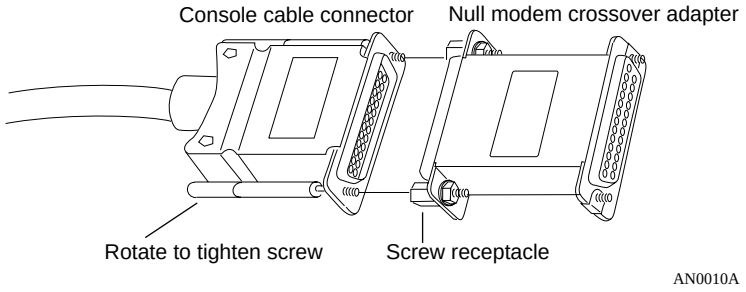


Figure 1-20. Attaching the Null Modem Crossover Adapter

5. **Connect the other end of the null modem crossover adapter to the 25-pin plug connector on a standard AT serial cable.**
6. **Connect the complete cable unit to the communications interface at the back of the PC (Figure 1-21).**

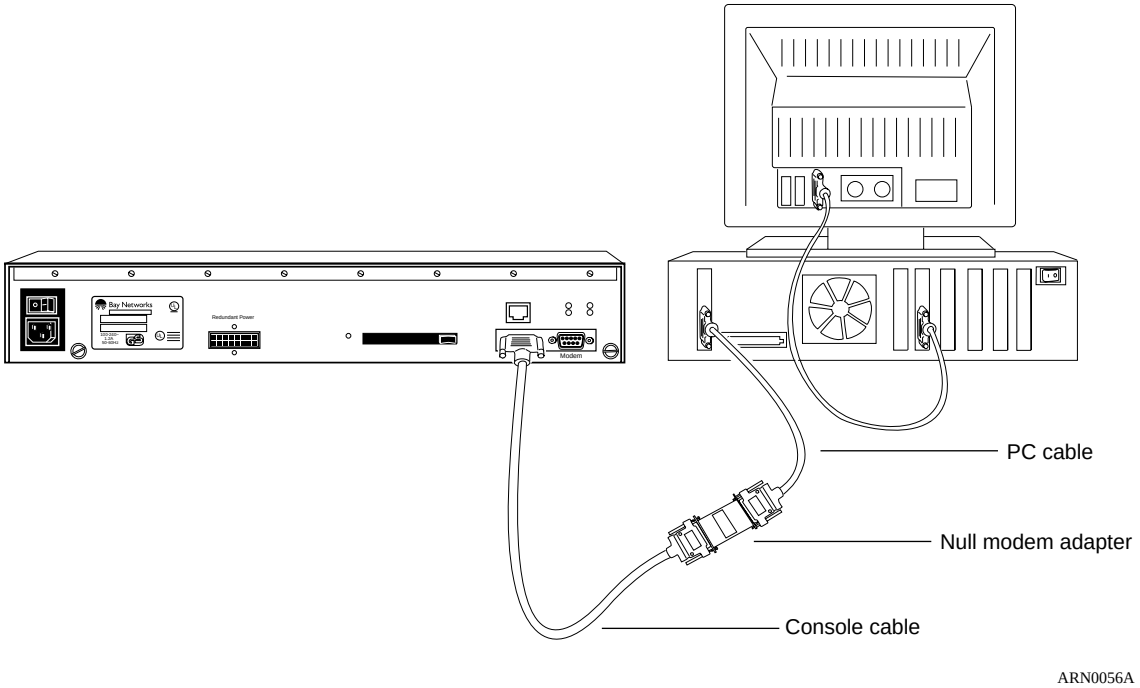


Figure 1-21. Connecting a PC Console to an ARN

Connecting a Terminal Console

To connect a terminal console to the ARN, you need both of these pieces in the ARN console/modem cable kit (Order No. 110310):

- Serial console/modem cable with 9-pin receptacle to 25-pin plug connectors (Order No. 110307)
- Null modem crossover adapter with two 25-pin receptacle connectors (Order No. 110308)

Once you have the appropriate equipment, complete the following steps:

1. **Turn on and configure the terminal, using the parameters in Table 1-3 and the terminal user guide.**

Table 1-3. Console Parameters

Parameter	Value
Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None

2. **Turn off the terminal.**
3. **Insert the 9-pin receptacle end of the console cable into the ARN Console connector.**
4. **Attach the null modem crossover adapter to the 25-pin connector.**

   Insert the screw on the cable connector into the receptacle on the adapter connector and tighten the screw (refer to Figure 1-20 on page 1-26).

5. **Attach the 25-pin receptacle connector on the combined cable and adapter to the console host connector (Figure 1-22).**

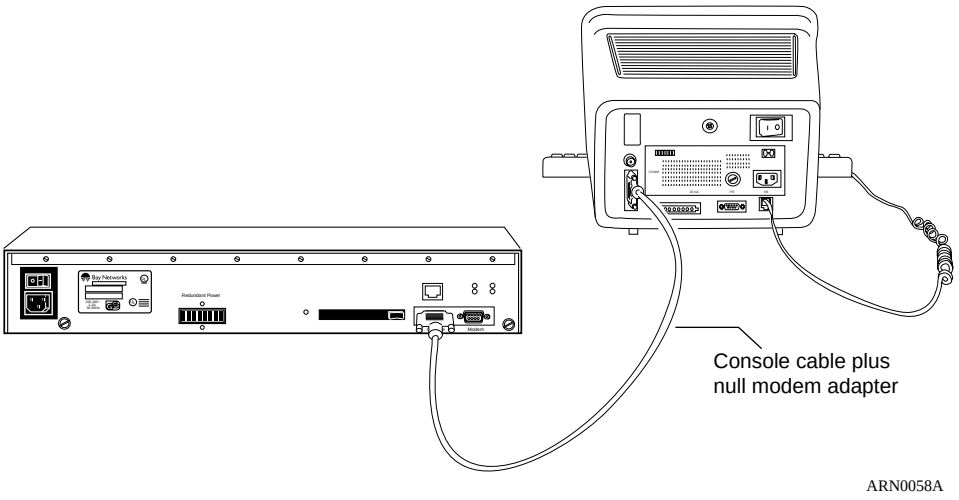


Figure 1-22. Connecting a Terminal Console to an ARN

Connecting a Console Modem

A modem provides a system administrator with remote access to the ARN. It is a good idea to connect a modem in case the ARN experiences system problems.

Note: To use the Netboot, Directed Netboot, or Local Boot software configuration options, you must connect a console the first time you power up the ARN. Refer to Chapter 2, "Starting the ARN," for details.

To use a modem connection for a management console, you can connect an external modem to the modem interface or you can connect a telephone line directly to an optional V.34 Console Modem adapter module. Both ports are on the ARN back panel.

Table 1-4 provides the default settings for both types of back-panel modem interfaces.

Table 1-4. Console Modem Defaults

Modem Signal/Parameter	Default Value
Clear To Send (CTS)	On
Data Terminal Ready (DTR)	Set to answer all incoming calls.
Data Carrier Detect (DCD) or Received Line Signal Detection (RLSD)	On while carrier is present (the ARN uses DCD to detect modem connect and disconnect).
Data Set Ready (DSR)	On
Ready to Send (RTS)	Ignored
Synchronous/Asynchronous Mode	Asynchronous
AutoAnswer	Answer on 2 rings with DTR active.
Local Character Echo	Off
Supervisory Functions	Off
Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None

Connecting an External Console Modem

To connect an external modem to the ARN back panel, you need an AT or Hayes compatible modem and the modem cable (Order No. 110307) that came in the ARN console/modem cable kit.

Note: Do *not* use the null modem crossover adapter (Order No. 110308) in the ARN cable kit to connect to a modem.

Complete the following steps:

1. **Configure the modem, using the parameters in Table 1-4.**

   Refer to the modem user guide for instructions.

2. **Turn off the modem.**

3. **Insert the 9-pin receptacle end of the modem cable into the ARN Console interface (Figure 1-23).**

4. **Insert the 25-pin plug at the other end of the modem cable into the modem RS-232 data communications interface.**

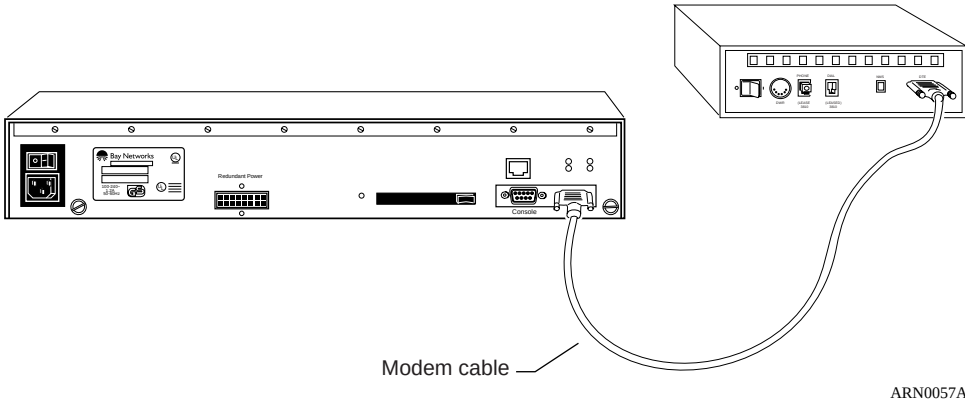


Figure 1-23. Connecting an External Console Modem

Connecting to an Integrated V.34 Console Modem Module

If your ARN contains an optional V.34 Console Modem module, you can connect the RJ-11 jack from the telephone line directly to the V.34 Console Modem interface. Table 1-4 on page 1-29 provides the default parameter settings for the V.34 Console Modem.

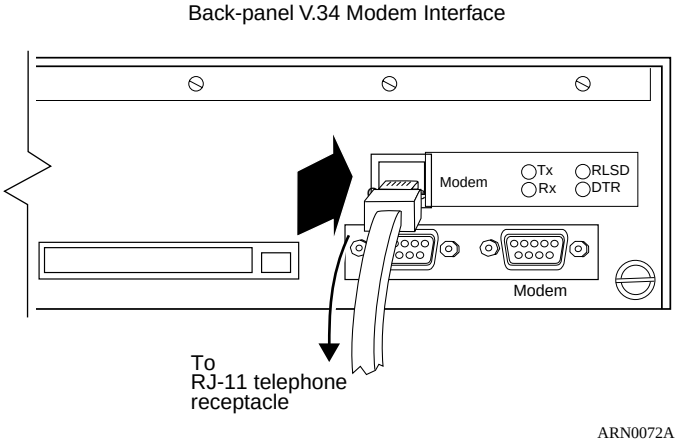


Figure 1-24. Connecting to an Integrated Console Modem

Connecting the Power Cable

Danger: Be sure that the power switch on the ARN back panel is in the OFF (0) position before you connect the power cable.

To connect the power cable to the ARN, complete these steps:

1. **Connect the power cable to the power connector on the left side of the ARN back panel (Figure 1-25).**

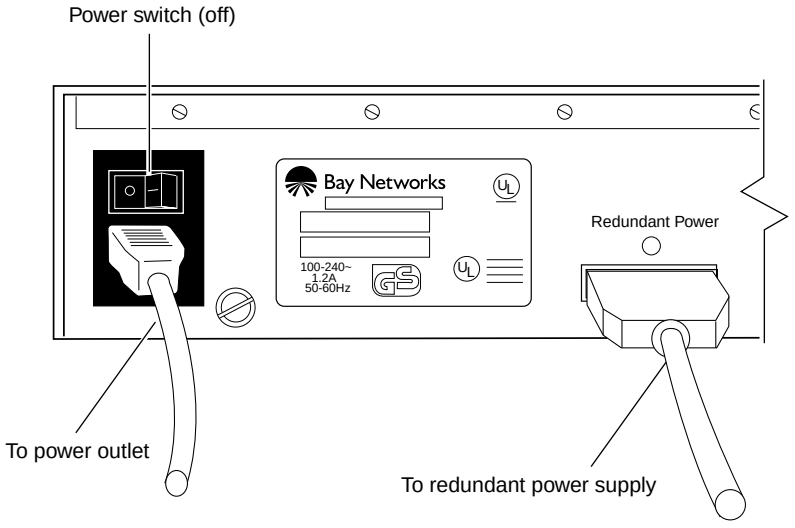


Figure 1-25. Connecting the Power Cable to the ARN

2. **Connect the remote end of the power cable to a grounded outlet.**

Note: For information about connecting a redundant power supply to the ARN, refer to the documentation that came with your power supply.

Installing the Flash Memory Card

Bay Networks ships the router software on a PCMCIA flash memory card (Figure 1-26). The flash memory card provides storage for the Nonvolatile File System (NVFS) in the ARN.

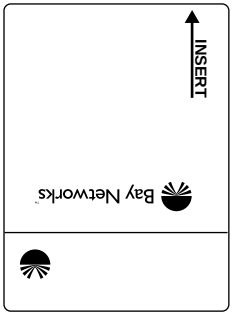


Figure 1-26. Flash Memory Card

Before starting the ARN, install the flash memory card supplied with the router:

1. **Position the card with the label facing up and the INSERT arrow pointing toward the card receptacle.**
2. **Insert the card into the receptacle (Figure 1-27) and gently push the card until it fits snugly into place.**

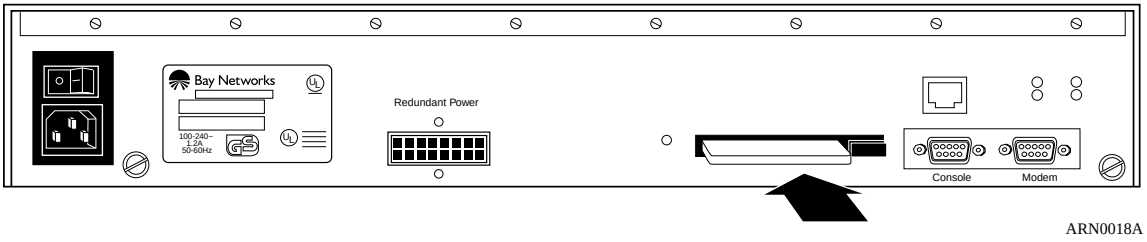


Figure 1-27. Inserting the Flash Memory Card in the ARN Receptacle

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting the ARN	Chapter 2
Operating the ARN	Chapter 3
Configuring the ARN for Netboot and Directed Netboot	Appendix A
Using Local Boot (the Quick-Start Procedure)	Appendix B
Technical Specifications	Appendix C

Chapter 2
Starting the ARN

This chapter describes how to start the BayStack ARN router, as follows:

Topic	Go to
Understanding the startup process	2-1
Starting the ARN for the first time	2-4
Using EZ-Install	2-5
Using Netboot, Directed Netboot, or Local Boot	2-6
Where to go next	2-16

Understanding the Startup Process

To operate, the ARN requires two files: a software image and a configuration file. Each time you start the ARN, it completes a process to load these files.

- The *software image* contains a group of executable files that support the protocols that the network requires. The ARN uses the software image called *arn.exe*. The process of obtaining and using this image is called *booting*.
- To bridge and route traffic, the ARN also needs a configuration file that is tailored to the network. A *configuration file* is a binary system file that contains hardware and software configuration data. The default configuration file is named *config*.

Bay Networks ships the executable and default configuration files on a PCMCIA flash card, but the ARN can also obtain them over the network. Getting a file over the network is called network booting, or *netbooting*. Getting a file from the router file system, stored in flash memory, is *local booting*.

When you start the ARN for the first time, it completes an initial startup procedure to boot and connect to the network using either a default configuration file or one already customized and available on the network.

You use one of four boot options to complete the initial software startup. Table 2-1 summarizes the four options; the sections that follow provide steps for completing each option.

Table 2-1. Summary of Initial Startup Options

Boot Option	Source for Image file	Source for Configuration File	Description and Requirements
EZ-Install	Local	Network (serial interface only)	The default option. The ARN boots from local flash memory, then obtains its configuration file from a remote workstation that is configured as a Bootstrap Protocol (BootP) server. The ARN saves the configuration to the flash memory. This option requires a High-Level Data Link Control (HDLC) or frame relay serial connection.
Netboot*	Local or Network	Local or Network	The ARN locates and obtains *at least one* startup file from a remote workstation that is configured as a BootP server. This option requires a communications connection over an HDLC, frame relay, Ethernet, token ring, or DSU/CSU interface, and a local console connection.
Directed Netboot†	Local or Network	Local or Network	The ARN obtains *at least one* startup file from a remote workstation that is configured as a Trivial File Transfer Protocol (TFTP) server. You must specify the IP address of the TFTP server and the complete path to the startup files before booting. This option requires a communications connection over an HDLC, frame relay, Ethernet, token ring, or DSU/CSU interface, and a local console connection.
Local Boot	Local	Local	The ARN boots from a local software image and generic startup configuration file. You create a customized configuration file by running the Quick-Start script. This option requires a local console connection and an installed BayRS flash memory card. If you attempt to local boot the ARN/DC without the flash memory card inserted, the router does not operate.

* The ARN supports netboot over serial, Ethernet, token ring, and 56/64K DSU/CSU interfaces only.

† The ARN supports directed netboot over serial, Ethernet, token ring, and 56/64K DSU/CSU interfaces only.

You may not be able to use all methods described in this chapter to boot over some interfaces on your router. For example, you cannot netboot over an FT1/T1 interface. In some cases, you may use one interface to boot your router and then switch to a different interface (such as the FT1/T1 DSU/CSU) to establish your initial IP network connection to the management workstation.

Table 2-2 lists supported boot options by interface type.

Table 2-2. Supported Boot Options by Interface

Interface	Supported	Not Supported
Ethernet	EZ-Install, Netboot, Directed Netboot, Local boot	
Token Ring	EZ-Install, Netboot, Directed Netboot, Local boot	
Serial (synchronous)	EZ-Install, Netboot, Directed Netboot, Local boot	
56K/64K DSU/CSU	EZ-Install, Netboot, Directed Netboot, Local boot	
ISDN S/T (leased line)	EZ-Install, Local boot	Netboot, Directed Netboot
FT1/T1 DSU/CSU	EZ-Install, Local boot	Netboot, Directed Netboot
FE1/E1 DSU/CSU	EZ-Install, Local boot	Netboot, Directed Netboot
ISDN U (switched line)	None	All
V.34 modem	None	All

Starting the ARN for the First Time

The ARN factory defaults are set to find the image file and configuration file from the following locations:

- Image file -- on the *local* PCMCIA flash memory card
- Configuration file -- *over the network*

These default settings work with the default EZ-Install procedure.

The first time you power on an ARN, the router steps through its diagnostic tests and then attempts to boot over all of its serial (COM) interfaces using EZ-Install.

Note: Coordinate the initial startup of the ARN with your network administrator. To determine which software configuration option is best for your site and for instructions on setting up a boot server, the network administrator can refer to *Configuring BayStack Remote Access*.

If your network administrator has configured the network for the EZ-Install procedure, the router boots using its local image and obtains its configuration file over the network. Your network administrator can then connect to the ARN and manage it remotely. For more information, refer to the next section, "Using EZ-Install."

If your network administrator does not configure the network for EZ-Install, the ARN cannot obtain its configuration file from the network, and the EZ-Install procedure fails. The ARN then attempts to boot locally with the configuration file that resides on its flash memory card. Refer to "Using Netboot, Directed Netboot, or Local Boot" for more information.

If both the EZ-Install and local boot attempts fail, the EZ-Install and local boot processes repeat until one of the following occurs:

- The ARN boots successfully.
- You interrupt the boot process to enter the ARN monitor.
- You turn off the ARN.

The following sections describe how to use each of the different boot options for the ARN.

Using EZ-Install

EZ-Install is the default installation option provided by Bay Networks. This option requires that your network administrator has set up the network so that you can start the EZ-Install procedure. In addition, this option requires that you:

- Install a flash memory card.

  For instructions, see "Installing the Flash Memory Card" on page 1-33.

- Connect at least one serial (COM) interface to the network.

  For instructions, see "Connecting Communications Cables" on page 1-10.

Note: If your ARN does not have a COM interface, you must configure the ARN using one of the other methods such as netboot or directed netboot over an Ethernet or token ring interface. Or, you may local boot the ARN and run the Quick-Start script. For more information, see "Using Netboot, Directed Netboot, or Local Boot" on page 2-6.

To use EZ-Install:

1. **Press the power switch on the ARN back panel to the ON position.**

   The ARN comes on and activates EZ-Install.

Note: If you power on the ARN before the network administrator is ready, restart the ARN by pressing the reset button on the rear panel. See Chapter 3, "Operating the ARN" for more information on resetting the ARN.

2. **Ensure that the ARN boots correctly.**

   When the ARN boots, its LEDs flash in a particular order. For information on checking the ARN front-panel LEDs to ensure that the installation was successful, see "Understanding the ARN LEDs" on page 3-1.

Using Netboot, Directed Netboot, or Local Boot

When you netboot or local boot the ARN, you must use a command line interface that accesses the router software. To use a command line interface, you can:

- Wait for the ARN to local boot (that is, wait for the router to fail EZ-Install and then attempt to boot using its local configuration file). After the ARN boots locally, you can log in to the Technician Interface and redefine the boot process.
- Interrupt the boot process using a break sequence and log in to the ARN monitor to redefine the boot process.

Using the netboot, directed netboot, or local boot options requires that you:

- Connect any necessary communications cables to access the network.
- Connect a management console.
- Connect the ARN power cable.
- Install a flash memory card.

See Chapter 1, “Installing the ARN” for instructions on how to complete these tasks.

Interrupting the Boot Process

Interrupting the boot process automatically starts the ARN monitor. Using the ARN monitor allows you to bypass the EZ-Install procedure.

Note: Before you power on the ARN, make sure that you have installed the router and connected the management console equipment you need (see “Connecting a Management Console” on page 1-25).

To interrupt the boot process:

1. **Press the power switch on the ARN back panel to the On position.**

   As the router powers on, your console displays the ARN diagnostic tests. After successfully completing these tests, the router begins the EZ-Install procedure and attempts to boot over the network.

2. **While the router is running the EZ-Install procedure, issue a break sequence from the management console.**

   The ARN monitor login prompt appears.

Note: Be sure to issue a break sequence before the boot process completes. Break sequences can vary, depending on the console type. Some management consoles have specific "Break" keys on their keyboards; other require a key sequence to issue a break (for example, **Cntrl-C** or **~ #**). For the break sequence for your management console, see the PC/terminal documentation.

Logging in to the Command Line Software

Regardless of the command line software used (ARN monitor or Technician Interface) the procedures to log in are identical.

To log in to the command line:

1. **Type the following command (noting the use of an uppercase "M") at the login prompt and press the Return key:**

   Manager

   The Technician Interface or ARN monitor command line prompt appears. You are now using a command line interface to the router.

2. **To use the netboot, directed netboot, or the local boot option, go to one of the following sections that describes the procedure you want to use:**

   - "Continuing with Netboot" on page 2-8
   - "Continuing with Directed Netboot" on page 2-10
   - "Continuing with Local Boot (the Quick-Start Procedure)" on page 2-13

Continuing with Netboot

Note: Continuing with the netboot option requires that you have already logged in to either the ARN monitor or Technician Interface command line software. For instructions, see "Logging in to the Command Line Software" on page 2-7.

To use the netboot option, you must have at least one serial, Ethernet, or token ring interface connected to the network. Before you start the netboot procedure, ask your network administrator to:

- Verify that the network is set up for the netboot procedure, as described in the *Configuring BayStack Remote Access* guide.
- Provide you with the parameter arguments to the interface configuration command **ifconfig** you will use in Step 4.

  The **ifconfig** command configures the parameters necessary to load the software image file and configuration file from a remote server over the network.

Note: Keep a record of the complete **ifconfig** command, because you need it for future reference.

You can use the ARN monitor, Technician Interface, or Site Manager to perform netboot. However, this guide assumes that you are using either the ARN monitor or the Technician Interface.

To use the netboot option:

1. **At the command line prompt, enter the ifconfig command provided to you by your network administrator and press the Return key.**

   The following is a sample command:

   ifconfig com1 9.0.0.2 255.0.0.0 9.0.0.3

   For more information about the **ifconfig** command, see "Using the ifconfig Command" on page A-2.

2. **Enter the following command and press the Return key to verify the configuration you specified in Step 1:**

   getcfg

The **getcfg** command shows the source location, either local or network, of the boot image file and the network configuration file. It also shows the interface configuration settings that you specified using the **ifconfig** command.

If **getcfg** displays the correct information, continue to the next step. Otherwise, reenter the correct **ifconfig** command. If you need assistance, contact your network administrator.

3. **Enter the following command and press the Return key to boot the ARN:**

   boot

   Your console displays messages indicating the progress of the netboot procedure.

Note: If the ARN cannot find a software image file or a configuration file using the netboot procedure, it attempts to local boot once. If both attempts fail, the ARN continues to netboot and local boot until it boots successfully. If the ARN remains in this loop, follow the steps in "Interrupting the Boot Process" on page 2-6.

4. **Ensure that the ARN boots correctly and successfully connects to the network.**

   When the ARN boots, its LEDs flash in a particular order. To ensure that the installation was successful, see "Ensuring a Successful Installation" on page 3-9.

   Contact your network administrator to verify that the ARN is now connected to the network. Your network administrator can refer to *Configuring BayStack Remote Access* to troubleshoot any problems.

   If you need additional assistance, contact your local Bay Networks Technical Solutions Center.

Note: After connecting the ARN to the network, you can replace the local management console with a modem connection to enable remote dial-in access.

Continuing with Directed Netboot

Note: Continuing with the netboot option requires that you have already logged in to either the ARN monitor or Technician Interface command line software. For instructions, see "Logging in to the Command Line Software" on page 2-7.

You must have at least one serial, 56/64K DSU/CSU, Ethernet, or token ring interface connected to the network to use the directed netboot option. Before you start the directed netboot procedure, ask your network administrator to:

- Verify that the network is set up so that you can start the directed netboot procedure.
- Provide you with the parameter arguments to the interface configuration command **ifconfig** you will use in Step 1.

  The **ifconfig** command configures the parameters necessary to load the software image file and the configuration file from a remote server over the network.
- Provide you with the boot configuration commands (**bconfig**) to use in Step 2.

  The **bconfig** command lets you specify the location of a startup file. To use directed netboot, the location must include the following information:

  -- The source (either local or network) of the image file and the configuration file

  -- The address of the TFTP server

  -- The full directory path description locating the files on the TFTP server

Note: Keep a record of the complete commands; you need them for future reference.

You can use the ARN monitor, Technician Interface, or Site Manager to perform directed netboot. However, this guide assumes that you are using either the ARN monitor or the Technician Interface. To manage the ARN from a remote site, refer to *Configuring Bay Stack Remote Access.*

To use the directed netboot feature:

1. **At the command line prompt, enter the** ifconfig **command provided to you by your network administrator and press the Return key.**

   The following is a sample command:

   ifconfig com1 9.0.0.2 255.0.0.0 9.0.0.3

   For more information about the **ifconfig** command, see “Using the ifconfig Command” on page A-2.

2. **Enter the** bconfig **commands provided by your network administrator and press the Return key.**

   You must enter one **bconfig** command to specify the location of the software image, and another to specify the location of the configuration file.

   The following are sample commands:

   bconfig image network 192.32.5.8 /usr/arnstartup/arn.exe
   bconfig config network 192.32.5.8 /usr/arnstartup/config

   For more information about the **bconfig** command, see “Using the bconfig Command” on page A-7.

3. **Type the following command and press the Return key to verify the configuration you specified in Step 3:**

   getcfg

   The get configuration data command **getcfg** shows the location of the boot image file and network configuration file, the interface configuration settings that you specified using the **ifconfig** command, as well as the TFTP server information and file paths that you specified using the **bconfig** commands.

   Verify the interface configuration, as shown in Figure 2-1.

```
$ getcfg

Boot Options
       boot image = network
       boot config = network
       host IP address = 192.32.5.8
       image pathname =
            "/usr/arnstartup/krnl_arn.exe"
       config pathname =
            "/usr/arnstartup/config"

Netboot Parameters:

       MAU1...None
       XCVR2..None
       COM1...IP=9.0.0.2, Mask=255.0.0.0, Next Hop=9.0.0.3
       COM2...EZ-Install (disabled)
       COM3...EZ-Install (disabled)
       COM4...EZ-Install (disabled)
       COM5...EZ-Install (disabled)
```

ARN0080A

Figure 2-1. Verifying Directed Netboot Configuration

If **getcfg** displays the correct information, continue to Step 4. Otherwise, correct and reenter the **ifconfig** and **bconfig** commands. If you need assistance, contact your network administrator.

4. **Type the following command and press the Return key to boot the ARN:**

   boot

Note: If the ARN cannot find a software image file or a configuration file using the directed netboot procedure, it attempts to netboot once. If the netboot procedure fails, the ARN tries to local boot once. If all three boot attempts fail, the ARN continues to try directed netboot, netboot, and local boot until it boots successfully. If the ARN remains in this loop, follow the steps in “Interrupting the Boot Process” on page 2-6.

5. **Ensure that the ARN boots correctly.**

When the ARN boots, its LEDs flash in a particular order. To ensure that the installation was successful, see “Ensuring a Successful Installation” on page 3-9.

6. **Ensure that the ARN is successfully connected to your network.**

   To verify that the ARN is now connected to the network, contact your network administrator. To troubleshoot any problems, your network administrator can refer to *Configuring BayStack Remote Access.*

   If you need additional assistance, contact your local Bay Networks Technical Solutions Center.

Note: After connecting the ARN to the network, you can replace the management console connection with a modem connection to enable remote dial-in access.

Continuing with Local Boot (the Quick-Start Procedure)

Note: Continuing with the netboot option requires that you have already logged in to either the ARN monitor or Technician Interface command line software. For instructions, see “Logging in to the Command Line Software” on page 2-7.

You can use either the ARN monitor or the Technician Interface to configure the ARN to local boot. However, you must use the Technician Interface to run the Quick-Start script.

Note: Before starting the local boot procedure, ask your network administrator to assist you in completing the Quick-Start worksheets in Appendix B.

To use the local boot feature:

1. **At the command line prompt, type the following command and press the Return key to configure the ARN to use its local config file:**

   bconfig config local

Note: Since the default setting for finding the software image is `local`; you do not have to change this setting for the local boot option.

2. **Type the following command and press the Return key to boot the ARN:**

   boot

Note: If the ARN tries to local boot and cannot find a software image file or a configuration file, it attempts to netboot once. If both attempts fail, the ARN continues to local boot and netboot until it boots successfully. If the ARN remains in this loop, follow the steps in "Interrupting the Boot Process" on page 2-6.

3. **Ensure that the ARN boots correctly.**

   When the ARN boots, its LEDs flash in a particular order. To ensure that the installation was successful, see "Ensuring a Successful Installation" on page 3-9.

   After the ARN boots using its local software image and configuration file, the Technician Interface login prompt appears.

4. **Type the following command (noting the use of an uppercase "M") at the login prompt and press the Return key:**

   Manager

   The Technician Interface prompt (`$`) appears.

Note: To check the contents of the router local file system on the installed flash memory card, type **dir** and press the Return key. The *arn.exe* software image, *config* file, and *inst_arn.bat* file should appear among the files listed.

5. **Enter the following command and press the Return key to run the Quick-Start script:**

   run inst_arn.bat

   The Quick-Start script begins running.

6. **Using your completed Quick-Start worksheet from Appendix B, enter the appropriate network information as the prompts appear.**

   The ARN uses this information to configure interfaces to the network.

   For sample Quick-Start screen output and for information on using Quick-Start commands, see Appendix B.

7. **Choose whether you want to configure another module/port.**

   Entering **n** stops the Quick-Start script and returns you to the Technician interface prompt. Entering **y** allows you to configure another module/port.

   Once the install script completes, the ARN starts bridging and routing traffic.

8. **Ensure that the ARN is successfully connected to your network.**

   To verify that the ARN is now connected to the network, contact your network administrator. To troubleshoot any problems, your network administrator can refer to *Configuring BayStack Remote Access.*

   If you need additional assistance, contact your local Bay Networks Technical Solutions Center.

Note: After connecting the ARN to the network, you can replace the management console connection with a modem connection to enable remote dial-in access.

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Operating the ARN	Chapter 3
Configuring the ARN for Netboot and Directed Netboot	Appendix A
Using Local Boot (the Quick-Start Procedure)	Appendix B
Technical Specifications	Appendix C

Chapter 3
Operating the ARN

This chapter describes how to operate the BayStack ARN router, as follows:

Topic	Page
Understanding LED descriptions	3-1
Ensuring a successful installation	3-9
Powering on and off the ARN	3-11
Resetting the ARN	3-12
Removing a flash memory card	3-13
Protecting memory card files	3-14
Where to go next	3-15

Understanding the ARN LEDs

Light-emitting diodes (LEDs) on the ARN provide information about how the ARN is operating. The following sections describe the ARN LEDs:

- Base Module LEDs
- Expansion Module LEDs
- Adapter Module LEDs

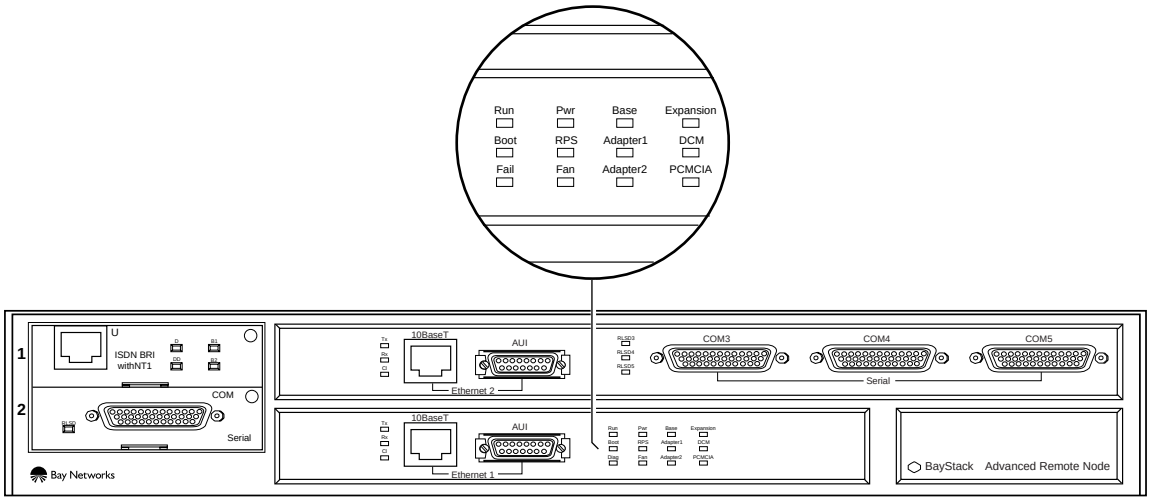
Note: For information about LEDs on the optional V.34 Modem Console module on the ARN back panel, see Table 3-14 on page 3-9.

Base Module LEDs

The base module includes diagnostic LEDs and LAN interface LEDs, visible on the front panel of the ARN.

Diagnostic LEDs

The base module diagnostic LEDs (Figure 3-1) indicate the status of the ARN itself. All of these LEDs light briefly when you turn on the ARN power switch.



ARN0059A

Figure 3-1. ARN Base Module Diagnostic LEDs

Table 3-1 describes the base module diagnostic LEDs.

Table 3-1. Base Module Diagnostic LEDs

LED	Meaning
Run	Flashes for 1 to 3 minutes, indicating that diagnostic tests are running. When it lights again and remains on, the ARN is operational.
Boot	Lights for 1 to 3 minutes, indicating that diagnostic tests were successful and the ARN is booting.
Fail	Lights again and remains on when diagnostic failure occurs.

(continued)

Table 3-1. Base Module Diagnostic LEDs *(continued)*

LED	Meaning
Pwr	Lights and remains on when the ARN is on and receiving power.
RPS	Lights and remains on when the redundant power supply (optional) is operating.
Fan	Lights and remains on if one or more ARN cooling fans stop operating.
Base	Lights and remains on when the base module is operating properly. Flashes slowly to indicate that the module is running its diagnostic tests. Flashes rapidly to indicate that the module failed its diagnostic tests.
Adapter1	Lights and remains on when adapter module #1 is operating properly. Flashes slowly to indicate that the module is running its diagnostic tests. Flashes rapidly to indicate that the module failed its diagnostic tests.
Adapter2	Lights and remains on when adapter module #2 is operating properly. Flashes slowly to indicate that the module is running its diagnostic tests. Flashes rapidly to indicate that the module failed its diagnostic tests.
Expansion	Lights and remains on when an expansion module is installed and operating properly. Flashes slowly to indicate that the module is running its diagnostic tests. Flashes rapidly to indicate that the module failed its diagnostic tests.
DCM	Lights and remains on when an RMON DCM is installed and operating properly. Flashes slowly to indicate that the module is running its diagnostic tests. Flashes rapidly to indicate that the module failed its diagnostic tests.
PCMCIA	Lights and remains on when the ARN contains a flash memory card in its PCMCIA slot.

Ethernet 10BASE-T LEDs

Table 3-2 describes the base module Ethernet 10BASE-T LEDs.

Table 3-2. Base Module Ethernet 10BASE-T LEDs

LED	Meaning
Tx (Transmit)	Lights when the Ethernet interface transmits data.
Rx (Receive)	Lights when the Ethernet interface receives data.
Cl (Collision)	Lights when the Ethernet interface detects a collision.

Ethernet 10/100BASE-Tx LEDs

Table 3-3 describes the base module Ethernet 10/100BASE-Tx LEDs.

Table 3-3. Base Module Ethernet 10/100BASE-Tx LEDs

LED	Meaning
TX (Transmit)	Lights when the Ethernet interface transmits data.
RX (Receive)	Lights when the Ethernet interface receives data.
CL (Collision)	Lights when the Ethernet interface detects a collision.
Link	Lights when the Ethernet interface has an established link.
100	Lights when the Ethernet interface is running at 100Mbps. If not lit, the interface is running at 10Mbps.

Ethernet 100BASE-Fx LEDs

Table 3-4 describes the base module Ethernet 100Base-Fx LEDs.

Table 3-4. Base Module Ethernet 100Base-Fx LEDs

LED	Meaning
TX (Transmit)	Lights when the Ethernet interface transmits data.
RX (Receive)	Lights when the Ethernet interface receives data.
Link	Lights when the Ethernet interface has an established link.
100	Lights when the Ethernet interface is running at 100Mbps.

Token Ring LEDs

Table 3-5 describes the base module token ring LEDs.

Table 3-5. Base Module Token Ring LEDs

LED	Meaning
RCVR (Receiver)	Lights when the token ring interface is connected to the network.
NSRT (Insert)	Lights when you insert the ARN into the token ring network.
WFLT (Wire Fault)	Lights when the token ring hardware detects a wire fault condition.

Expansion Module LEDs

When the ARN has an installed expansion module, its interface LEDs are visible on the front panel. For the location of the optional ARN expansion module, see Figure 1-4 on page 1-9.

Note: The ARN base module boots to a fully operational state before bringing up expansion module interfaces.

Ethernet LEDs

Table 3-6 describes the expansion module LEDs for the second Ethernet2 interface.

Table 3-6. Expansion Module Ethernet LEDs

LED	Meaning
Tx (Transmit)	Lights when the Ethernet interface is transmitting data over the network.
Rx (Receive)	Lights when the Ethernet interface is receiving data from the network.
CI (Collision)	Lights when the Ethernet interface detects a collision on the network.

Token Ring LEDs

Table 3-7 describes the expansion module token ring LEDs.

Table 3-7. Expansion Module Token Ring LEDs

LED	Meaning
RCVR (Receiver)	Lights when the token ring interface is connected to the network.
NSRT (Insert)	Lights when you insert the ARN into the token ring network.
WFLT (Wire Fault)	Lights when the token ring hardware detects a wire fault condition.

Serial LEDs

Table 3-8 describes the expansion module serial interface LEDs.

Table 3-8. Expansion Module Serial LEDs

LED	Meaning
RLSD3 (Received Line Signal Detection 3)	Lights when Received Line Signal Detection is active on COM 3.
RLSD4 (Received Line Signal Detection 4)	Lights when Received Line Signal Detection is active on COM 4.
RLSD5 (Received Line Signal Detection 5)	Lights when Received Line Signal Detection is active on COM 5.

Adapter Module LEDs

When the ARN/DC has an optional adapter module installed, its interface LEDs are visible on the front panel. For the location of the two ARN/DC adapter module slots, see Figure 1-4 on page 1-9.

Note: The ARN base module boots to a fully operational state before bringing up adapter module interfaces.

Serial LED

Table 3-9 describes the serial adapter module LED.

Table 3-9. Serial LED

LED	Meaning
RLSD	Lights when Received Line Signal Detection is active on the serial interface.

ISDN BRI LEDs (S/T or U Interfaces)

Table 3-10 describes the ISDN adapter module LEDs.

Table 3-10. ISDN BRI LEDs

LED	Meaning
S/T Interface	
Unlabeled LED	Lights when the ARN is using the D-channel.
U Interface	
D (D-channel; 16-KB Management Channel)	Lights when the ARN is using the D-channel.
DD (Data Detect)	Lights when the ISDN-BRI interface detects connection to an external device (that is, a switch).
B1 (B-Channel #1; 64-KB Data Channel)	Lights when the ARN is using B-channel #1.
B2 (B-Channel #2; 64-KB Data Channel)	Lights when the ARN is using B-channel #2.

56/64K DSU/CSU LEDs

Table 3-11 describes the 56/64K DSU/CSU adapter module LEDs.

Table 3-11. 56/64K DSU/CSU LEDs

LED	Meaning
TxD (Transmit Data)	Lights when the 56/64K DSU/CSU interface transmits data over the network.
RxD (Receive Data)	Lights when the 56/64K DSU/CSU interface receives data from the network.
CD (Carrier Detect)	Lights when the 56/64K DSU/CSU interface detects a connection to another device.
Test	Lights when the 56/64K DSU/CSU interface is in test or loopback mode.

FT1/T1 and FE1/E1 DSU/CSU LEDs

Table 3-12 describes the FT1/T1 and FE1/E1 DSU/CSU adapter module LEDs.

Table 3-12. FT1/T1 and FE1/E1 DSU/CSU LEDs

LED	Meaning
Red ALM	Lights when the port is in a red alarm state.
Yellow ALM	Lights when the DSU/CSU receives a yellow alarm signal from the network.
Loop	Lights when you set the interface to loopback mode.
Synch	Lights when the port is synchronized with the T1/E1 network.

X.25 PAD LEDs

Table 3-13 describes the X.25 PAD adapter module LEDs.

Table 3-13. X.25 PAD LEDs

LED	Meaning
TxD (Transmit Data)	Lights when the X.25 PAD interface transmits data over the network.
RxD (Receive Data)	Lights when the X.25 PAD interface receives data from the network.

V.34 Modem LEDs

Table 3-14 describes the front-panel V.34 modem adapter module LEDs.

Note: The ARN back-panel supports an optional V.34 Console Modem module. Table 3-14 also applies to these LEDs.

.

Table 3-14. V.34 Modem LEDs

LED	Meaning
TX (Transmit)	Lights when the V.34 modem interface transmits data over the network.
RX (Receive)	Lights when the V.34 modem interface receives data from the network.
RLSD (Received Line Signal Detection)	Lights when the modem activates.
DTR (Data Terminal Ready)	Lights when the V.34 modem interface is ready to transmit data.

Ensuring a Successful Installation

After connecting the ARN to the network, you can ensure a successful installation by checking the diagnostic LEDs on the front panel of the base module (refer to Figure 3-1 on page 3-2).

When you power on the ARN, the following sequence of front panel LED activity should occur:

- All base module LEDs light momentarily; this tests that the LEDs are operational.
- The Run, Boot, and Fail LEDs count through a short, initial startup sequence.
- The Pwr (power) LED lights and remains on.
- The Run LED begins flashing and continues to flash until the ARN completes all diagnostic tests.
- As the diagnostic procedure tests each module, the LED representing that module flashes slowly. If the module passes its diagnostic test, the LED remains on. If the module fails its diagnostic test, the Fail LED remains on and the module LED flashes rapidly.

- After completing the diagnostic testing procedure, the boot process begins. The Run and Boot LEDs indicate the boot status as shown in Table 3-15.

Table 3-15. Boot Status LEDs

Boot Status	Run LED	Boot LED
Local Boot	Off	On
Netboot (attempting)	Off	Flashing
Netboot (downloading)	Flashing	On
Interrupted (using ARN monitor)	Flashing	Flashing

- After the boot process completes, the Run LED lights and the Boot LED turns off, indicating that the ARN is operational.

If the LEDs on the ARN light in this sequence, your installation is successful. Contact your network administrator to verify that the ARN is now connected to the network.

If the LEDs do not light in this sequence, your network administrator can refer to *Configuring BayStack Remote Access* to help troubleshoot the problem.

Note: If the ARN does not contain an expansion module, an adapter module, a redundant power supply, a data collection module, or a flash card, the LEDs associated with these components remain off.

If you need additional assistance, contact your local Bay Networks Technical Solutions Center.

Powering On and Off

The ARN power switch is located on the back panel (Figure 3-2).

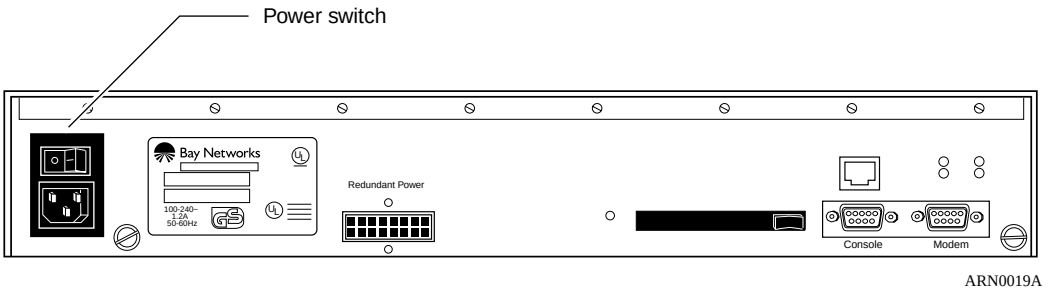


Figure 3-2. ARN Power Switch

To power on an ARN, press the power switch to the ON position (1). Verify that air is flowing by placing your hand next to the fan vents. If you cannot feel air flowing from the vents, and either the Pwr and Fail LEDs do not light or the Fail LED remains on, turn the power switch to the OFF position. Wait one minute and then turn the power switch to the ON position.

If the ARN does not turn on, check the power cable connections. See “Connecting the Power Cable” on page 1-32 for information. If the ARN will not power on, contact the Bay Networks Technical Solutions Center.

To power off the ARN, press the power switch to the OFF position (0).

Note: To ensure a complete power cycle, you should wait at least 4 seconds between powering off the ARN and powering it back on.

Resetting the ARN

The Reset button is set inside the ARN back panel and resides next to the flash card slot, as shown in Figure 3-3.

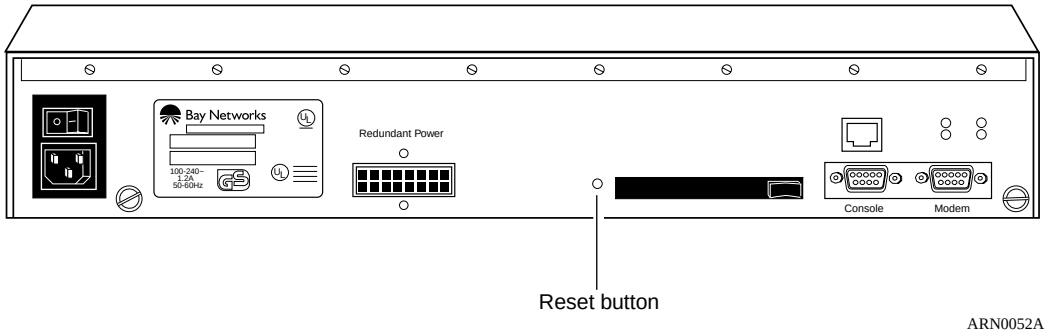


Figure 3-3. ARN Reset Button

To press the Reset button, insert a small pointed object (for example, a paper clip) into the Reset button hole.

You can use the Reset button to reboot the ARN hardware without cycling power, as follows:

- To *warm-boot* the ARN (no diagnostic tests run), press the Reset button for less than 5 seconds.
- To *cold-boot* the ARN (diagnostic tests run), press the Reset button for more than 5 seconds.

Note: If you reset the ARN while it is running its diagnostic tests, the LEDs remain in the state they were in when you pressed the Reset button. You must cycle power on the ARN to reset the LEDs.

Removing a Flash Memory Card

To remove a memory card from an ARN:

1. **Press the eject button next to the card receptacle on the back panel.**

   The card pops out slightly.

2. **Pull the memory card out of the card receptacle.**

   See Figure 3-4.

Caution: Do not remove the flash memory card while the router is operating. Removing the memory card interferes with current networking operations.

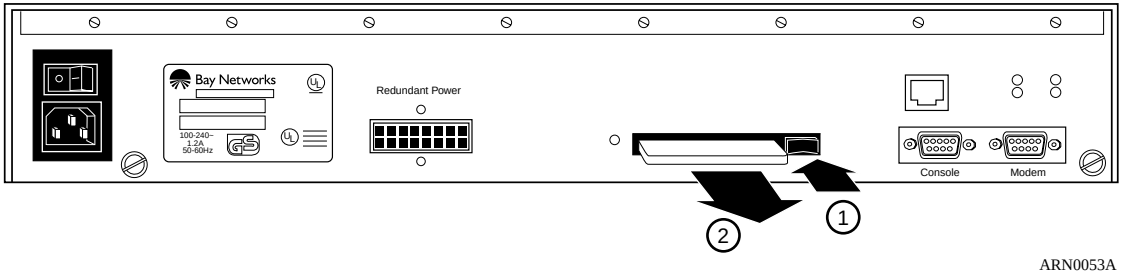


Figure 3-4. Removing an ARN Flash Memory Card

To insert another memory card into the receptacle, refer to “Installing the Flash Memory Card” on page 1-33.

When you remove a formatted memory card, the nonvolatile file system (NVFS) automatically removes access to the card. When you insert and format a card or insert an already formatted card, the NVFS automatically provides access.

Protecting Memory Card Files

Bay Networks ships each memory card with its read/write protect switch in the unprotected position (Figure 3-5). After successfully loading the configuration file and saving your configuration, you may want to write-protect the memory card for backup purposes.

Note: You typically do not operate the ARN with a write-protected memory card. You should make a copy of your configuration on another memory card, write-protect that card, and store it in a safe place.

To change memory card protection, complete the following steps:

1. **Remove the memory card as described on page 3-13.**
2. **Adjust the read-write protect switch, which is located on the edge opposite the INSERT arrow of the memory card (Figure 3-5).**

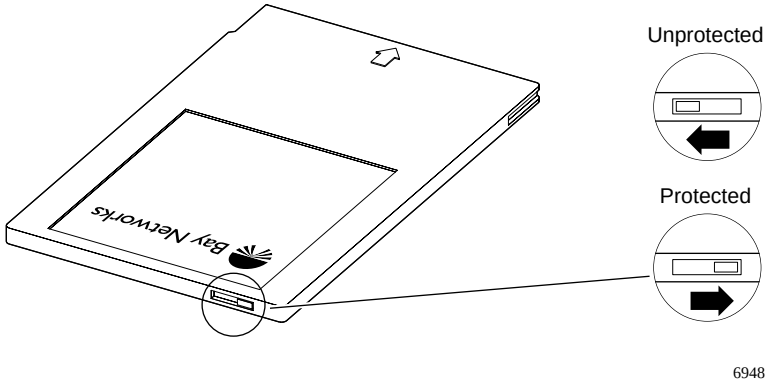


Figure 3-5. Memory Card Read/Write Protect Switch

3. **Reinsert the memory card into the card receptacle (refer to Figure 1-27 on page 1-33).**

Where to Go Next

Use the following table to determine where you want to go next.

For information about	Go to
Starting the ARN	Chapter 2
Configuring the ARN for Netboot and Directed Netboot	Appendix A
Using Local Boot (the Quick-Start Procedure)	Appendix B
Technical Specifications	Appendix C

Chapter 4
Installing a WAN Adapter Module

This chapter describes how to install a wide area network (WAN) adapter module in the ARN.

Topic	Page
Preparing for Installation	4-1
Installing an Adapter Module	4-6
What to Do Next	4-8

Note: This chapter provides generic instructions that apply to all ARN WAN adapter modules. For specific information about the module you are installing, this document refers to a module-specific *Supplement*, which ships in the adapter module upgrade kit.

Preparing for Installation

Before installing the module, examine the contents of your adapter module upgrade kit. If any parts appear damaged, call the Bay Networks Technical Solutions Center immediately.

Downloading New Boot and Diagnostic Code

When installating an adapter module as an upgrade to your existing hardware configuration, you must verify that the ARN contains the minimum required version of programmable read-only memory (PROM) code for the module you are installing. BayRS release media includes the latest boot and diagnostic code at the time it is shipped, but if your upgrade requires newer code, you must manually download it to the router PROM.

To determine which version of boot and diagnostic code you need when installing a particular adapter module, see see the module-specific *Supplement* that ships with the module, and to the Document Change Notice or the Release Notes distributed with your BayRS release. For instructions on how to upgrade the PROM code in flash memory, refer to the *Upgrading Routers* guide.

Powering Down

Before installing a WAN adapter module:

4. **Turn off the ARN.**

   Set the power switch to 0, off (refer to Figure 1-25 in Chapter 1).

Warning: You cannot hot-swap ARN WAN adapter modules.

5. **If present, turn off or disconnect the redundant power supply.**
6. **Attach an antistatic wrist strap.**

Caution: Electrostatic discharge can damage hardware. You must wear the antistatic wrist strap whenever you handle printed circuit boards.

You receive an antistatic wrist strap with the adapter module. See the instructions included with the wrist strap.

The wrist strap directs static electricity from your body to the router chassis, preventing discharge to sensitive electronic components.

7. **Determine which of the two front-panel adapter module slots to use (Figure 4-1).**

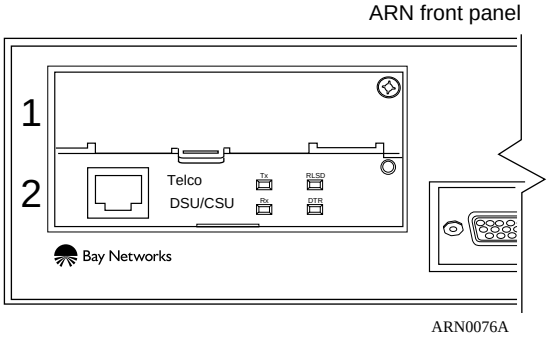


Figure 4-1. Location of Adapter Module Slots 1 and 2

8. **Remove the installed adapter module or the slot filler panel.**

   - To install the adapter module in an empty slot, go to "Removing the Filler Panel" on 4-3.
   - To replace an installed adapter module, go to "Removing an Adapter Module" on 4-5.

Removing the Filler Panel

To remove the filler panel from an empty adapter module slot:

1. **Using a Phillips screwdriver, remove the screw that secures the filler panel in either slot 1 or slot 2 (Figure 4-2).**

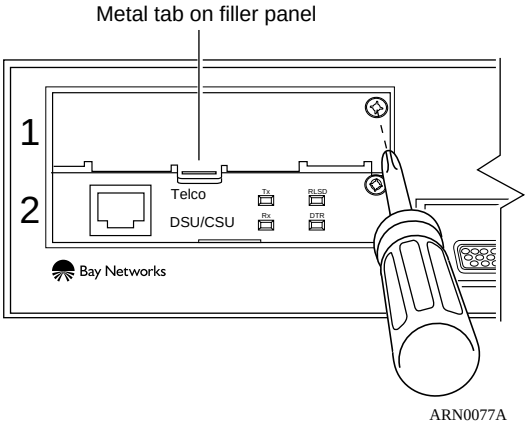


Figure 4-2. Removing the Filler Panel from Slot 1

2. **Grasp the metal tab on the filler panel and pull forward to remove the panel.**
3. **Set the filler panel aside.**

   To operate the ARN without an adapter module in this slot, you must reinstall the filler panel.
4. **Skip the next section and go to "Installing an Adapter Module" on page 4-6.**

Removing an Adapter Module

To remove a WAN adapter module:

1. **Using a Phillips screwdriver, remove the screw that secures the adapter module you want to remove (Figure 4-3).**

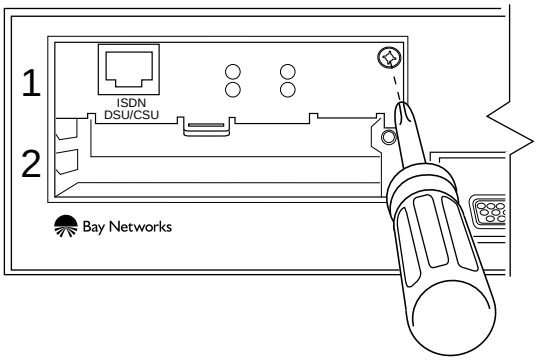


Figure 4-3. Removing the Adapter Module Screw

2. **Pull the adapter module toward you to detach it from the base module connector in the ARN chassis.**

   Grasp the adapter module's metal tab, or insert a thin tool (such as a flathead screwdriver) in the slot on the tab.

   Be prepared to apply some force, but stop pulling immediately once the adapter module is free from the base module connector.

3. **Slide the adapter module all the way out of the slot.**
4. **Place the adapter module in an antistatic bag.**
5. **Go to the next section, "Installing an Adapter Module."**

Installing an Adapter Module

To install a WAN adapter module:

1. **Hold the adapter module with the components facing up (Figure 4-4).**

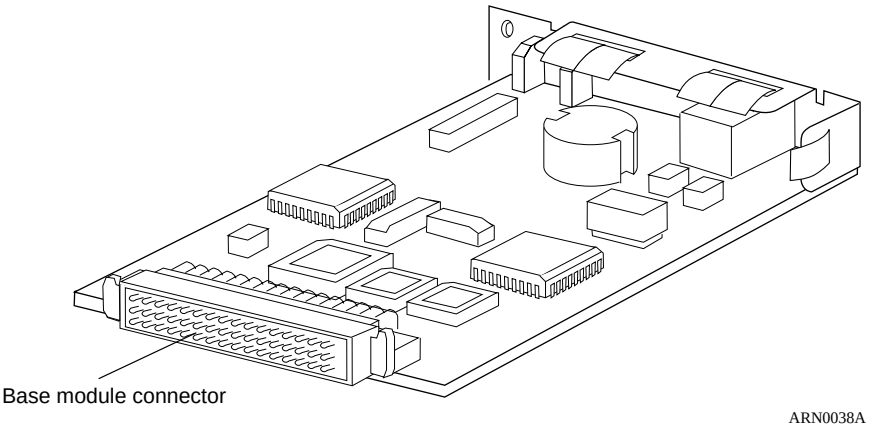


Figure 4-4. Adapter Module Ready for Installation

2. **Slide the adapter module into the slot, making sure that the slot guides engage both sides of the adapter module (Figure 4-5).**

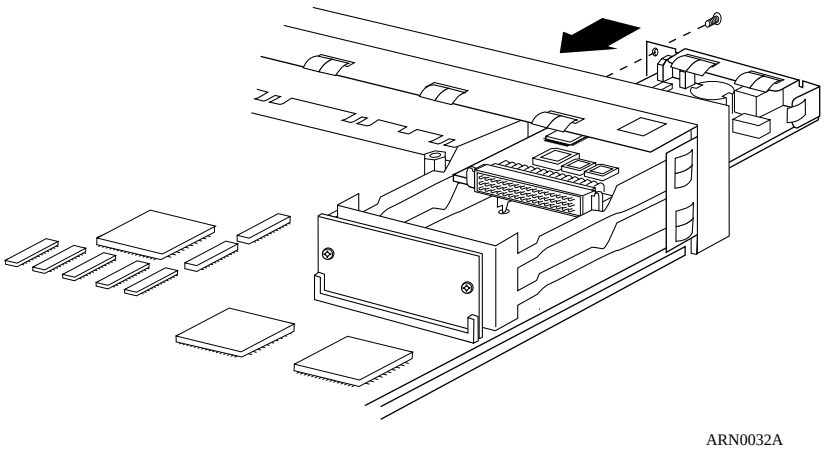


Figure 4-5. Inserting the Adapter Module

3. **Push the adapter module in until its connector pins align with the base module connector socket in the ARN chassis.**
4. **Using a Phillips screwdriver, insert and tighten the screw (Figure 4-6).**

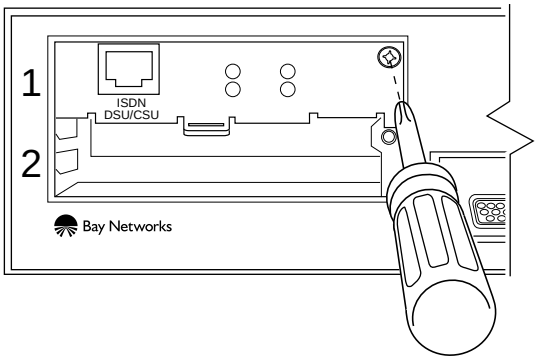


Figure 4-6. Securing the Adapter Module to the Front Panel

5. **Remove the antistatic wrist strap.**
6. **Connect the appropriate WAN cabling to the new interface.**

   For cabling information, see the module-specific *Supplement* and the Bay Networks *Cable Guide*.
7. **Turn power on, and check the diagnostic LEDs on the front panel of the base module.**

   See "Ensuring a Successful Installation" in Chapter 3.

Note: See your module-specific *Supplement* for information about the LEDs on the newly installed module. The new module's LEDs will not indicate data transfer until you have configured and enabled software services.

If the module fails its diagnostic test, the Fail LED remains on and the module LED flashes rapidly.

What to Do Next

Before you can use the WAN adapter module after installation, you must start the router on the network and modify its configuration file to include the new interface.

See your module-specific *Supplement* for a list of software installation tasks and related documentation.

Please note the following:

- BayRS recognizes the ARN WAN adapter module interfaces by their front-panel slot number. For example, even if there is no adapter module installed in slot 1, the interface in slot 2 is named COM2 or ISDN2.
- Configuring software for additional interfaces may increase the ARN memory requirements.

Appendix A
Configuring the ARN for Netboot and Directed Netboot

This appendix describes how to configure the BayStack ARN router for Netboot and Directed Netboot, as follows:

Topic	Page
Using the **ifconfig** command	A-2
Using the **bconfig** command	A-7
Verifying your configuration	A-8

The **ifconfig** and **bconfig** commands configure the ARN for netboot and directed netboot.

- Use the **ifconfig** command to configure the router initial IP interface to the network. You need this information to complete the procedure in "Continuing with Netboot" on page 2-8.
- Use the **bconfig** command to specify the location and name of the ARN software image file and the configuration file. You need this information to complete the procedure in "Continuing with Directed Netboot" on page 2-10.

To determine the appropriate **ifconfig** command and **bconfig** commands for the ARN at your site, contact your network administrator. (Your network administrator has information on these commands in *Configuring BayStack Remote Access.*)

Using the ifconfig Command

A router interface cannot communicate in an IP network without an IP address. Because an ARN netboots over one of its serial, 56/64K DSU/CSU, Ethernet, or token ring links, the netboot interface must have a valid IP address.

You use the interface configuration command **ifconfig** to do the following:

- Configure the router's initial IP interface to the network. (The initial IP interface should be a serial interface if you are using EZ-Install.) You also use the same procedure to configure other serial interfaces for the netbooting procedure.
- Configure Ethernet or token ring interfaces for the netbooting procedure.
- Enable or disable netbooting on an interface.

Configuring an IP Serial or 56/64K DSU/CSU Interface for Netbooting

Configure a serial or 56/64K DSU/CSU (COM) interface to the IP network using the following interface configuration command:

ifconfig [*synchronous options*] *<interface>* [*<IP address> <subnet mask>* [*<next hop address>*]]

The *synchronous options* variable indicates some combination of the following settings:

[**-d** | **-r** [**56** | **64**] | **-fr** [**-annexd** | **-lmi** | **-annexa**] | **-int_clk**]

Note: Make sure to separate command options with spaces.

Table A-1 describes the **ifconfig** command settings for configuring a COM interface.

Table A-1. COM Interface ifconfig Command Settings

Setting	Description
Default Setting	
-d	Resets the router IP interface settings to the default values. This setting tries four WAN configurations in the following order until it finds the correct type for the router connection to the network: 1. Bay Networks HDLC encapsulation (also referred to as Bay Networks Standard Point-to-Point) with external clocking 2. Frame Relay Annex D 3. Frame Relay LMI 4. Frame Relay Annex A
56/64K CSU/DSU Settings	
-r	Configures 56/64K telco service for 56K DDS or 64K Clear Channel. Use one of the following options: **56** or **64**.
Frame Relay Settings	
-fr	Configures the router COM interface as a frame relay connection. With this setting, use one of the following options to specify a DLCMI setting: **-annexd**, **-annexa**, or **-lmi**.
-annexd **-annexa** **-lmi**	When one of these options is used with the **-fr** setting, it specifies a DLCMI setting. Use the same setting as the network to which the router's frame relay interface is connected. The default setting for frame relay is **-annexd**.
Internal Clocking Setting	
-int_clk	Sets the serial interface to internal clocking at 1.25 MB/s. If you do not specify this setting, the router defaults to external clocking.
IP Connector Setting	
<interface>	Specifies the IP connector you are configuring. Use the format **com**<*port #*>.
IP Address Settings	
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted decimal notation.

(continued)

Table A-1. COM Interface ifconfig Command Settings *(continued)*

Setting	Description
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted decimal notation. Specify this address only if there are intermediate routers between the router and the BootP server.

Configuring an Ethernet Interface for Network Booting

To configure any ARN Ethernet interface for network booting, use the following command format:

ifconfig [**-d**] *<interface>* [*<IP address>* *<subnet mask>* [*<next hop address>*]]

Table A-2 describes the **ifconfig** command settings for configuring the router's Ethernet interface.

Table A-2. Ethernet Interface ifconfig Command Settings

Setting	Description
Default Setting	
-d	Resets the router IP interface settings to the default values. Resetting an Ethernet interface makes it inactive in the network booting process. (The output of the **getcfg** command shows the default as None.)
IP Connector Setting	
<interface>	Specifies the IP connector you are configuring. Use the format **xcvr**<*port #*>.
IP Address Settings	
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted decimal notation.
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted decimal notation. Specify this address only if there are intermediate routers between the router and the BootP server.

Configuring a Token Ring Interface for Network Booting

To configure an ARN token ring interface for network booting, use the following command format:

ifconfig [**-d**] [**-r**<*speed*>] *<interface>* [*<IP address> <subnet mask>* [*<next hop address>*]]

Table A-3 describes the **ifconfig** command settings for configuring the router token ring interface.

Table A-3. Token Ring Interface ifconfig Command Settings

Setting	Description
Default Setting	
-d	Resets the router IP interface settings to the default values. Resetting a token ring interface makes it inactive in the network booting process. (The output of the **getcfg** command shows the default as None.)
IP Connector Setting	
-r<*speed*>	Specifies the speed of the token ring interface. Enter either **16** or **4** (Mb/s). The default is 16 Mb/s.
<interface>	Specifies the IP connector you are configuring. Use the format **mau**<*port #*>.
IP Address Settings	
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted decimal notation.
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted decimal notation. Specify this address only if there are intermediate routers between the router and the BootP server.

Enabling and Disabling Interfaces with ifconfig

To enable or disable an ARN interface for the network boot process, use the following command formats:

ifconfig -disable *<interface>*
ifconfig -enable *<interface>*

Table A-4 describes the **ifconfig** command settings for enabling and disabling interfaces for network booting.

Table A-4. ifconfig Settings to Enable and Disable Netboot Interfaces

Setting	Description
<interface>	Specifies the IP connector you are enabling or disabling for network booting. Use one of the following formats: **xcvr***<port #>* **com***<port #>* **mau***<port #>*

Examples of ifconfig Commands

1. Configure the current interface for the default Netboot procedure.

   ifconfig -d

2. Specify the IP address and subnet mask of the base module Ethernet interface.

   ifconfig xcvr1 21.3.5.62 255.255.255.0

3. Specify the IP address and subnet mask of the expansion module Ethernet interface.

   ifconfig xcvr2 21.3.5.61 255.255.255.0

4. Configure the IP address and frame relay DLCMI of the third serial interface on the expansion module.

   ifconfig com3 21.3.5.62 -fr -annexa

5. Specify the IP address and subnet mask of the base module token ring interface.

   ifconfig mau1 21.3.4.77 255.255.255.0

Using the bconfig Command

You use the **bconfig** command to configure the boot option.

- To use *netboot*, you use the boot configuration command **bconfig** to specify that the ARN software image file or configuration file resides on the network.
- To use *directed netboot*, you use the **bconfig** command to specify the IP address of the server and the full pathname to the software image and configuration file.
- To use *local boot*, you use the **bconfig** command to specify that the configuration file and software image both reside on the local file system (that is, the PCMCIA Flash card).

Format for the bconfig Command

To configure an interface for netboot, use the following format:

bconfig -d [**image** | **config**]

To configure an interface for directed netboot, use the following format:

bconfig [**image** | **config**] [**local** | **network** [*<TFTP host> <TFTP pathname>*]]

You must use the **bconfig** command twice: once to specify the location of the software image, and again to specify the location of the configuration file.

Refer to Table A-5 for a complete description of the **bconfig** command.

Table A-5. bconfig Command Settings

Option	Description
image	Indicates the router's software image.
config	Indicates the router's configuration file.
local	Indicates that the specified file (image or config) resides in the router's local file system.
network	Indicates that the specified file (image or config) resides on a remote file system.
<TFTP host>	Specifies the IP address of the TFTP server. If both the software image and configuration file are on the network, both files must reside on the same host.
<TFTP path>	Specifies the complete pathname of the remote software image or configuration file.
-d	Reverts to the default values for the software image or configuration file and nullifies any previously specified IP address and pathname for the file, thus disabling directed netboot.

Examples of bconfig Commands

1. Configure the default netboot procedure. Use a local image file and look for the configuration file over the network using BootP.

   bconfig -d image (or **bconfig image local**)
   bconfig -d config (or **bconfig config network**)

2. Use netboot for both the image file and the configuration file.

   bconfig image network
   bconfig config network

3. Use a local configuration file and use directed netboot for the software image file.

   bconfig image network 21.3.5.62 /usr/mykernel.exe
   bconfig config local

4. Use a local software image file and use directed netboot for the configuration file.

   bconfig image local
   bconfig config network 21.3.5.62 /usr/arnstartup/config

5. Use directed netboot for both the software image file and the configuration file.

   bconfig image network 21.3.5.62 /usr/mykernel.exe
   bconfig config network 21.3.5.62 /usr/arnstartup/config

Verifying Your Configuration

You can use the get configuration command **getcfg** to verify:

- Whether the router is set to boot using a local or remote software image
- Whether the router is set to configure using a local or remote configuration file
- The configuration of any serial, DSU/CSU, Ethernet, and token ring connectors

To display the ARN startup options, enter the following command:

getcfg

The following sample response shows the settings for an ARN with one Ethernet, one token ring, and five serial interfaces:

```
Boot Options

    boot image=local
    boot config=network

Netboot Parameters:

    MAU1...None
    XCVR2..None
    COM1...EZ-Install
    COM2...EZ-Install
    COM3...EZ-Install
    COM4...EZ-Install
    COM5...EZ-Install
```

Appendix B
Using Local Boot (the Quick-Start Procedure)

This appendix describes how to complete a local boot by running the Quick-Start script, as follows:

Topic	Page
Prepare to run Quick-Start	B-2
Understand Quick-Start connector names and numbers	B-2
Fill out Quick-Start sample worksheets	B-4
Run the Quick-Start script	B-16

This appendix explains how to local boot the ARN and create an initial Internet Protocol (IP) interface using the Quick-Start procedure to get the ARN router up and running on the network. (You can also configure additional interfaces using Quick-Start, but in most cases your initial IP interface connects you to the management workstation, where the network administrator uses Site Manager or some other management tool to fully customize your router's configuration.)

To start the ARN on the network using Quick-Start, you run the *inst_arn.bat* script and enter information at the prompts. The ARN automatically selects options for some prompts, and you can accept default values for many of the other prompts.

Before You Run Quick-Start

To aid you in answering Quick-Start prompts, some sample worksheets are provided. Fill them out with assistance from your network administrator. The worksheets contain options that appear at each prompt when configuring a serial interface, and space for you to enter your own information. If you are configuring an interface other than the serial interface, the prompts will differ from what is shown in the sample worksheets. In that case, use the sample worksheets only as a guide and review the actual Quick-Start prompts and options carefully before replying.

Be sure to fill out the worksheets and read all sections of this appendix before you run the Quick-Start script. The sections in this appendix, "Filling Out the Worksheets" and "Running the Quick-Start Script," provide additional information about the Quick-Start script.

Note: Contact your network administrator for assistance in selecting worksheet responses.

Understanding Quick-Start Connector Names and Numbers

The Quick-Start script assigns a name and number to each interface, depending on its location on the ARN.

In addition to either an Ethernet or token ring base module, the ARN can contain expansion modules and adapter modules (Figure B-1).

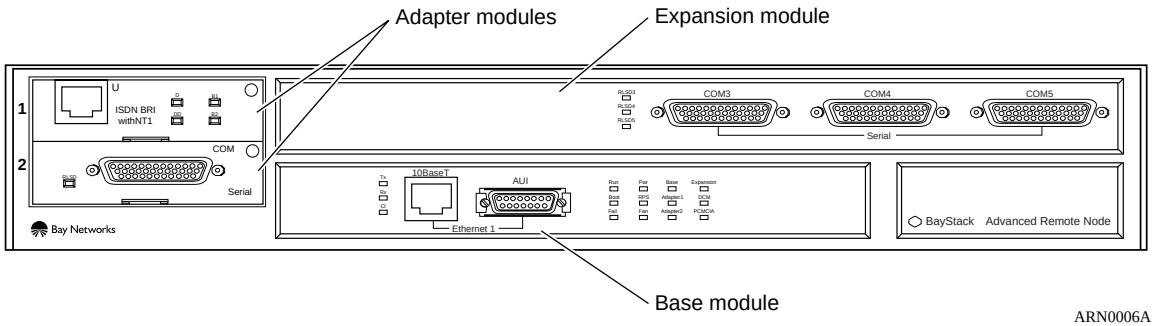


Figure B-1. ARN Module Locations

Table B-1 provides the connector names and numbers you should use during the Quick-Start procedure.

Table B-1. Quick-Start Connector Names and Numbers

	Module			
Interface*	**Base**	**Expansion**	**Adapter 1**	**Adapter 2**
Ethernet	XCVR1	XCVR2	N/A	N/A
Token Ring	MAU1	MAU2	N/A	N/A
Serial	N/A	COM3, COM4, or COM5	COM1	COM2
56/64K, FT1/T1, or FE1/E1 DSU/CSU	N/A	N/A	COM1	COM2

* The Quick-Start script does not support initial ISDN, X.25 PAD, or V.34 interface configuration.

Filling Out the Worksheets

The *inst_arn.bat* script provides many options for configuring the ARN on a network. Since typical remote access uses a serial interface over a wide area connection, this sample describes *only* the options involved with a serial configuration.

Note: This section provides worksheets only for a serial interface configuration over a wide area connection. It does not contain worksheets for LAN configuration options. If configuring a LAN interface, read the Quick-Start text and prompts carefully before responding, as they will differ from the serial sample.

We suggest the following procedure when you fill out worksheets:

1. **Fill out the Global Information Worksheet completely.**

   The sample worksheet lists options common to all serial interface configurations.

2. **After you record your protocol selections on the Global Information Worksheet, fill out *one* Router Protocol worksheet.**

   This worksheet lists specific options for RIP, OSPF, or Static Route configurations. For example, if you select RIP as your routing protocol, you need to fill out only the worksheet pertaining to RIP.

3. **Fill out *one* Wide Area Protocol worksheet.**

   This worksheet lists specific options for Bay Networks (proprietary) Point-to-Point Protocol (PPP), frame relay, Standard PPP, and switched multimegabit data service (SMDS) configurations. For example, if you select frame relay as your wide area protocol, you need to fill out only the frame relay worksheet.

4. **Run *inst_arn.bat* as described in "Running the Quick-Start Script" on page B-16.**

   Or, a remote-site operator runs the installation script as described in this guide.

5. **Once the router has an initial connection to the network, use the guide *Configuring BayStack Remote Access* to configure the router using Site Manager.**

Global Information Worksheet

This section contains the prompts and possible options relating to all ARN serial configurations. Write your selection in the "Your Response" column.

Global Information Worksheet

Step	Requested Information	Options	Your Response
1	Enter the module number [1]:	The script lists the available modules that you can use to connect the router's IP network interface to Site Manager. For example, the script might offer the following options: 1. Token Ring on Base Module 2. Serial on Adapter Module 1 3. Ethernet Tri-Serial on Expansion Module	Enter the number that corresponds to the module you want to use.
2	Driver Type:	If there is only one interface on the module you chose, the script automatically selects the driver type for that interface and bypasses this prompt. Otherwise, the script displays a menu of driver types. The actual menu depends on the modules you have installed.	Choose the Synchronous driver.

(continued)

Global Information Worksheet *(continued)*

Step	Requested Information	Options	Your Response
	Enter connector number [1]:	If there is only one connector on the module you chose, the script automatically assigns a connector number and bypasses this prompt. Otherwise, the script lists the available connectors. For example, for an ARN with five serial connectors, the options are 1. COM1 2. COM2 3. COM3 4. COM4 5. COM5	
	Enter clock source number [2]:	1. Internal 2. External	
	Enter clock speed number [10]:	This prompt appears only if you chose an Internal clock source. The script lists a range of values, with 64K as the default.	
	Enter circuit name [S#]:	The script displays a default circuit name for the COM interface you selected (for example, S11 for COM1 and S12 for COM2).	Press the Return key.

(continued)

Global Information Worksheet *(continued)*

Step	Requested Information	Options	Your Response
3	Enter IP address in dotted decimal notation:	Enter the IP address for the COM interface.	
	Enter IP subnetwork mask in dotted decimal notation:	Enter the subnetwork mask for the COM interface IP address.	
	Is the router connected to the same local area network as the Site Manager workstation? (y/n) [n]:	y(es) n(o)	Press the Return key.
	Enter routing protocol number [1]:	1. RIP 2. OSPF 3. Static Route to Site Manager	(Complete the worksheet for the protocol you select.)
	Enter wide area protocol number [1]:	1. Bay Networks Point-to-Point Protocol (Proprietary) 2. Frame Relay 3. Point-to-Point Protocol (PPP) Standard 4. Switched Multimegabit Data Service (SMDS)	(Complete the worksheet for the protocol you select.)
	Do you wish to set SNMP community management? (y/n) [n]:	y(es) n(o) Setting up SNMP community management is optional.	
4	Enter (TFTP) volume number [1]:	The script automatically selects “1” as the TFTP default volume.	None
5	Do you want to enable FTP? (y/n) [n]:	y(es) n(o) Enabling FTP is optional.	
	Enter (FTP) volume number [1]:	The script automatically selects “1” as the FTP default volume.	

(continued)

Global Information Worksheet *(continued)*

Step	Requested Information	Options	Your Response
6	Do you want to enable TI TELNET (y/n) [n]:	y(es) n(o) Enabling TELNET is optional.	
7	Do you wish to save this configuration to a file? (y/n) [y]	y(es) n(o)	Press the Return key.
	Enter filename [*startup.cfg*]:	We recommend using the default filename.	Press the Return key.
	Do you wish to set up another port/module? (y/n) [y]	y(es) n(o)	Type **n** and press the Return key.

Router Protocol Worksheets

This section contains requested information and possible options relating to the routing protocol choices on the Global Worksheet.

RIP Worksheet

Requested Information	Options	Your Response
RIP will listen to a specific route to the network or subnet where Site Manager is located. If you would also like RIP to listen to the default route (0.0.0.0.) then answer 'y' below. The default route is useful when no specific route is available in the RIP updates received by this router. Should RIP listen to the default route? (y/n) [n]:	y(es) n(o)	

(continued)

RIP Worksheet *(continued)*

Requested Information	Options	Your Response
Specify the version of RIP. The default is to run RIP1. Rip2 runs RIP2 without the automatic aggregation of subnets that RIP1 provides. RIG2_AGGR provices the automatic aggregation of subnets for RIP2. Enter Routing Protocol Number [1]:	1. RIP1 2. RIP2 3. RIP2_AGGR	

OSPF Worksheet

Requested Information	Options	Your Response
Enter OSPF router ID in dotted decimal notation:	Enter an IP address to uniquely identify the router in the OSPF domain. The router provides the IP address of the COM port. We suggest using the default IP address.	
Enter the OSPF area ID in dotted decimal notation [0.0.0.0]:	Enter the area ID. This ID must match the area ID of the router's neighbor. **Note:** The backbone area ID is always 0.0.0.0.	
Enable Simple Password authentication? (y/n) [n]:	y(es) n(o) **Note:** If you answer y(es), the router requests a password.	Password: _____
Follow default paths for unknown subnets? (y/n) [n]:	y(es) n(o)	

(continued)

OSPF Worksheet *(continued)*

Requested Information	Options	Your Response
Enter OSPF MTU size selection [1]:	1. Default 2. Ethernet size (Bay Networks Series 5 compatible) 3. User Defined MTU	
Enter OSPF interface type selection [1]:	1. Broadcast 2. NBMA 3. Point-to-Point 4. Point-to-Multipoint (Proprietary) 5. Point-to-Multipoint (Per OSPF Standard) **Note:** When using a wide area protocol other than Bay Networks Proprietary PPP, you should select NBMA.	
Enter decimal value in seconds for Hello Interval [10]: **Note:** This value must match all other interfaces in the OSPF area for connection to take place.	The script suggests the following intervals: Broadcast -- 10 seconds Point-to-Point -- 15 seconds NBMA -- 20 seconds Point-to-MultiPoint --10 seconds	
Enter decimal value in seconds for Router Dead Interval [40]: **Note:** This value must match all other interfaces in the OSPF area for connection to take place.	The script suggests the following intervals: Broadcast -- 40 seconds Point-to-Point -- 60 seconds NBMA -- 80 seconds Point-to-MultiPoint (STD) -- 40 seconds	
Enter decimal value for Router Priority [1]: (For Broadcast, NBMA, or Point-to-MultiPoint)	Enter a router priority value. The lower the value (above zero), the higher the priority. **Note:** If you set the router priority to zero (0), the router is not eligible to become the designated router on this network.	

(continued)

OSPF Worksheet *(continued)*

Requested Information	Options	Your Response
Enter decimal value in seconds for Poll Interval [120]: (For NBMA only)	Enter the largest number of seconds allowed between Hello packets that the router sends to an inactive NBMA neighbor. The router suggests a 120-second interval.	
Enter IP address of neighbor in dotted decimal notation or enter **q** to quit: (For NBMA only)	Enter addresses for all NBMA neighbors you want the router to communicate with. When you finish entering addresses, enter **q** and press the Return key.	
Enter IP address of neighbor in dotted decimal notation: (For PPP only)	Enter addresses for the PPP neighbor you want the router to communicate with.	

Static Route to Site Manager Worksheet

Requested Information	Options	Your Response
Destination Network [0.0.0.0]:	Enter the gateway address of the destination network. An address of 0.0.0.0 specifies the default route.	
Destination Network Mask [0.0.0.0]:	Enter the subnetwork mask of the destination network. A mask of 0.0.0.0 specifies the default route.	
Next-Hop Address:	Enter a next-hop address. All static routes require a next-hop address in the same subnet as the initial IP interface.	

(continued)

Static Route to Site Manager Worksheet *(continued)*

Requested Information	Options	Your Response
Follow the default route for unknown subnets? (y/n) [n]:	y(es) n(o) The default route does not apply for subnets unless you enter **y** at this prompt.	

Wide Area Protocol Worksheets

This section contains requested information and possible options relating to wide area protocol choices on the Global Worksheet.

Bay Networks Proprietary PPP Worksheet

Requested Information	Options	Your Response
Enter BofL (Breath of Life) timer value (1-60) [5]:	Enter the maximum amount of time that can elapse between the successful transmission of BofL messages.	
Enter Local Address selection [3]:	1. DCE 2. DTE 3. EXPLICIT **Note:** Reverse local and remote address values when configuring the device at the other end of the circuit. (Exception: When connecting to a Series 5 router that uses DCE/DTE addressing, use the SAME local address value.)	

(continued)

Bay Networks Proprietary PPP Worksheet *(continued)*

Requested Information	Options	Your Response
Enter Remote Address selection [3]:	1. DCE 2. DTE 3. EXPLICIT **Note:** Reverse local and remote address values when configuring the device at the other end of the circuit. (Exception: When connecting to a Series 5 router that uses DCE/DTE addressing, use the SAME local address value.)	

Frame Relay Worksheet

Requested Information	Options	Your Response
Enter Management type [3]:	1. DLCMI None 2. Rev 1 LMI 3. ANSI T1 617D 4. CCITT Annex A 5. LMI Switch 6. Annex D Switch 7. Annex A Switch	
Enter addressing type [4]:	1. ADDR Q.921 2. ADDR Q.922 (MARCH '90) 3. ADDR Q.922 (NOVEMBER '90) 4. ADDR Q.922	
Enter address field length [2]:	2. Two Bytes 3. Three Bytes 4. Four Bytes	
Enter DLCI number [30]: (For DLCMI None, LMI Switch, Annex D Switch, and Annex A Switch only)	Enter the permanent virtual channel (PVC) number. **Note:** The valid range for the DLCI number is between 16 and 1007.	

PPP Standard Worksheet

Requested Information	Options	Your Response
Enter Remote IP address in dotted decimal notation:	Enter the IP address of the peer connection.	
Do you wish to turn on the PPP echo function? (y/n) [n]:	y(es) n(o)	
Enable PAP (Password Authentication Protocol)? (y/n) [n]:	y(es) n(o) **Note:** If you answer y(es), the router requests a PAP ID and password for this interface. If you answer n(o), the router asks whether you want to enable CHAP.	
Enable CHAP (Challenge Handshake Authentication Protocol)? (y/n) [n]:	y(es) n(o) **Note:** If you answer y(es), the router requests a CHAP secret for this interface.	
Does the Remote Peer have PAP authentication enabled? (y/n) [n]:	y(es) n(o) **Note:** If you answer y(es), the router requests the PAP ID and password for the remote interface.	
Enable the LQR (Link Quality Reporting) Protocol? (y/n) [n]:	y(es) n(o) **Note:** Link Quality Monitoring on a Bay Networks Series 5 router is not compatible with this feature.	

(continued)

PPP Standard Worksheet *(continued)*

Requested Information	Options	Your Response
Enable use of the Remote Peer router's LQR Timer? (y/n) [y]: (For LQR Protocol only)	y(es) n(o) **Note:** If the LQR timer is enabled, the remote peer router maintains its own LQR timer for this interface. When the LQR timer is disabled, the AN is responsible for maintaining the timer for this interface.	
Number of seconds (1-120) [3]: (For LQR Protocol only)	Enter the maximum number of seconds between the transmission of LQR packets.	
Enter [inbound] success rate percentage (1-100) [90]:	Enter the minimal acceptable success rate (percentage) of packets transmitted by the peer router and received on this interface over the last five LQR reporting periods.	
Enter [outbound] success rate percentage (1-100) [90]:	Enter the minimal acceptable success rate (percentage) of packets transmitted by this interface and received by the peer router over the last five LQR reporting periods.	

SMDS Worksheet

Requested Information	Options	Your Response
Enter 10-digit individual address:	Enter the individual address assigned to you by your SMDS service provider.	
Enter 10-digit group address:	Enter the group address assigned to you by your SMDS service provider.	
Enter 10-digit arp address:	Enter the Address Resolution Protocol (ARP) address assigned to you by your SMDS service provider.	

Running the Quick-Start Script

The Quick-Start script is called *inst_arn.bat* and you run it as part of the Local Boot process.

Note: Before you run the Quick-Start script, make sure you have the completed worksheets with you.

Begin local boot as follows:

1. **At the Technician Interface** `login:` **prompt, enter Manager to log in.**
2. **Enter bconfig config local to configure the router to use the local** *config* **file when booting.**

   For information about the **bconfig** command, see "Using the bconfig Command" on page A-7.
3. **Reboot the router by entering boot.**

   The Technician Interface login prompt appears.
4. **Log in to the Technician Interface.**

   The Technician Interface mounts the local file system and displays a prompt indicating the present working directory.

5. **Type the following command and press the Return key:**

   run inst_arn.bat

6. **Follow the script online, using your worksheets when responding to its prompts.**

   The list of commands in Table B-2 describe how to interact with the Quick-Start script.

Table B-2. Quick-Start Commands

Task	Action	Details
Accept a default value	Press **Return**	Your console displays default values in brackets; for example, [E11].
Repeat a step (for example, if you make a mistake)	Press **Control-c** Press **n**	When prompted, “Terminate script y/n?” press the **n** key. You return to the beginning of the step so that you can reenter the information.
Stop the Quick-Start installation procedure	Press **Control-c** Press **y**	When prompted, “Terminate script y/n?” press the **y** key. The procedure is terminated and you return to the Technician Interface prompt. To restart the Quick-Start/Power-Start procedure, you must reboot the router by entering **boot**.

The script prompts you for the following information (in the order given):

a. The initial Global Worksheet information

b. Specific protocol information

c. Wide area protocol selection

d. Specific protocol information

e. The rest of the Global Worksheet information

After you enter all of the Global Worksheet protocol information, the script displays a Configuration Summary and prompts you to save the configuration to a file.

7. **Name and save the configuration file.**

   The script begins to test the configuration on the new IP interface (Figure B-2).

```
Testing local IP interface

ping -IP 192.32.00.000 -r5
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)


This test attempts to ping the Site Manager workstation.

NOTE: If routing has not yet converged, an attempt
       to ping the Site Manager workstation may fail.  If
       this happens, you may either enter a new IP address or
       quit and wait a short period of time and try again from
       the TI command line.

Type q<return> to cancel this test.

Enter IP address of Site Manager workstation:
```

Figure B-2. Starting the IP Interface Test

8. **To continue the IP configuration test, enter the IP address for the Site Manager workstation.**

   To cancel the test, enter **q**.

9. **Choose whether you want to configure another module/port.**

   If you enter **n**, (to stop configuring modules/ports), the Technician Interface prompt appears. If you enter **y**, you return to Step 6 of this procedure.

10. **When the Technician Interface prompt reappears, enter logout to exit the Technician Interface.**

Once the router creates and tests the configuration, it starts using the configuration information you entered. Refer to *Configuring BayStack Remote Access* to configure the router using Site Manager.

Appendix C
ARN Technical Specifications

This appendix provides technical specifications and a product overview of the ARN and its interface options, as follows:

Topic	Page
Physical specifications	C-1
Electrical specifications	C-2
Environmental specifications	C-2
Hardware communications options	C-3

Physical Specifications

The dimensions and weight of the ARN are as follows:

- Height: 2.8 in. (7.1 cm)
- Width: 17.25 in. (43.8 cm)
- Depth: 12.5 in. (31.8 cm)
- Weight: 15 lb (6.8 kg)

Your installation site must provide a certain amount of free space around the ARN to dissipate heat. The space requirements for installing the ARN at your site are as follows:

- Width: 22.5 in. (57.2 cm)
- Minimum depth: 15 in. (38.1 cm)
- Depth for servicing: 25 in. (63.5 cm)

If you are installing your ARN in an electronic equipment rack, make sure that the rack meets the following specifications:

- Heavy-duty steel construction
- Electronic Industries Association (EIA) standard hole-spacing
- Width of 19 in. (48.26 cm)
- Depth of 24 in. (60.96 cm)

Electrical Specifications

Your installation site must meet the following power requirements:

- Proximity to wall receptacle: within 6 ft (1.8 m) of the ARN
- Voltage: 100 to 240 VAC
- Amperage: 0.5 to 1.0 A

Table C-1 lists the wall outlet requirements.

Table C-1. ARN Wall Outlet Requirements

Country	Outlet	Voltage
United States/ Canada	National Electrical Manufacturers Association (NEMA) 5-15P standard outlet	100 to 120 V
Any other country	Your ARN distributor informs you of the outlet you need.	200 to 240 V

Environmental Specifications

The environmental requirements of the ARN are as follows:

- Altitude: 0 to 8,000 ft (0 to 2,438.4 m)
- Humidity: 10% to 90%, noncondensing
- Temperature: 32°F to 104°F (0°C to 40°C) stable

Hardware Communications Options

The ARN is designed to scale to your needs. In addition to either an Ethernet or token ring base module, you can add an optional expansion and up to two optional adapter modules to the ARN.

The ARN is available in the following base module configurations:

- One Ethernet AUI and Ethernet 10BASE-T interface
- One Ethernet 10/100BASE-Tx interface
- One Ethernet 100BASE-Fx interface
- One Token Ring interface (STP only)

The ARN supports the following expansion modules:

- One Ethernet AUI and Ethernet 10BASE-T interface
- One token ring media access unit interface (STP and UTP option)
- Three serial interfaces
- One Ethernet AUI and Ethernet 10BASE-T interface and three serial interfaces
- One token ring interface (STP and UTP option) and three serial interfaces

Note: The Ethernet AUI and 10BASE-T base and expansion modules can also contain an optional data collection module (DCM). This optional DCM gathers Ethernet statistics for a remote monitoring (RMON) utility. A subset of these statistics is gathered with a built-in RMON function on the Ethernet10/100BASE-Tx and -Fx interfaces. If your router has both types of RMON data collection installed, you can run the built-in RMON function or the optional DCM module, but not both at the same time. If you have one configured, the other is shut off. Your network administrator can refer to *Configuring RMON and RMON2 on BayRS Routers* for additional information about how to enable and use each RMON data collection implementation. Check also the *Documentation Change Notice* and *Release Notes* for related information.

The ARN also supports up to two of the following adapter modules:

- One serial interface
- One ISDN BRI S/T interface

- One ISDN BRI U interface
- One V.34 modem interface
- One 56/64K DSU/CSU interface
- One FE1/E1 DSU/CSU interface
- One FT1/T1 DSU/CSU interface
- One X.25 PAD interface

Table C-2 describes each interface.

Table C-2. Network Interfaces Available on ARNs

Network Interface	Description
Ethernet and Second Ethernet	Supports the Ethernet and IEEE 802.3 standards that provide LAN connectivity. The ARN can have up to two Ethernet interfaces: one on the base module and one on an expansion module. The Ethernet interface on the base module can be a 10BASE-T, a 10/100BASE-Tx, or a 100BASE-Fx. The 10BASE-T can also be used as an expansion module. There are two ports available for each 10BASE-T: a 10BASE-T and an 802.3 AUI port; however, you can use only one of these ports (10BASE-T or AUI) on each module at a time. The 10BASE-T and 10/100BASE-Tx interfaces provide unshielded twisted-pair support; the 10BASE-T AUI interface provides broadband, baseband, fiber, and shielded twisted-pair support, depending on the transceiver and cabling you use. The 100BASE-Fx provides fiber support.
Token Ring and Second Token Ring	Supports the token ring and IEEE 802.5 standards that provide LAN connectivity. The ARN can have up to two token ring interfaces: one on the base module and one on an expansion module. The token ring base module supports a 9-pin (DB-9) STP token ring interface. The token ring expansion module supports both a 9-pin (DB-9) STP connector and a UTP connector; however, you can use only one port (STP or UTP) on the expansion module at a time. Both token ring connector types support the 802.5 media access control (MAC) token-passing protocol, the 802.2 Type 1 (connectionless) protocol, the 802.2 Type 2 (connection-oriented) protocol, and the 16-Mb/s Early Token Release (ETR) protocol over the appropriate cabling.

(continued)

Table C-2. Network Interfaces Available on ARNs *(continued)*

Network Interface	Description
Serial	Provides WAN connectivity. ARN models can have up to five serial ports (three on an expansion module and up to two adapter modules). Each port can operate independently with RS-232, RS-422, RS-449, RS-530, V.28, V.35, and X.21 cables. Serial capability allows internal or external clocking.
ISDN BRI	Supports an S/T or U interface. The BRI provides two B channels, and supports full D-channel signaling and call setup/tear-down as defined in 1988 CCITT (now ITU-T) Q.921 and Q.931. For more information on ISDN, functional groups, or reference points, refer to *Configuring Dial Services*. The ISDN BRI option is available as an adapter module for any ARN model.
56/64K DSU/CSU	Supports a 56/64K DSU/CSU interface.
FT1/T1 and FE1/E1 DSU/CSU	Provides an interface to convert incoming packet data from an external T1 or E1 line (using an RJ-48C connector). Because the interface integrates the Channel Service Unit (CSU) function on each T1 or E1 port, it allows direct connection to the network. A T1 port can transmit or receive a total of 24 DSO HDLC channels for each DS1 frame.
X.25 PAD	Provides an X.25 PAD interface.
V.34 Modem	Provides a V.34 modem interface.

Note: For the proper cables or cable pinouts to use for each interface type, see the *Cable Guide*.

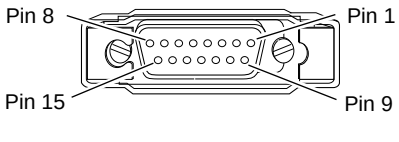
Ethernet Attachment Unit Interface (AUI)

The ARN Ethernet 10BASE-T base module, Ethernet expansion module, and Ethernet/tri-serial expansion modules contain a 10BASE-T standard 802.3 AUI DB-15 receptacle with a slide lock.

Note: The AUI is designed only for connection to a transceiver. Connecting the AUI directly to an AUI on an Ethernet station (without a transceiver) violates IEEE 802.3 standards.

Table C-3 shows the pin assignments for the standard 15-pin AUI receptacle on the ARN base or expansion module and identifies its pin locations.

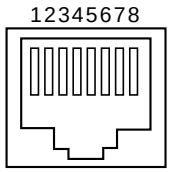
Table C-3. AUI Pin Assignments

Pin Assignment	Pin No.	Signal Name
	1	GND
	2	CI-A
	3	DO-A
	4	GND
	5	DI-A
	6	+12 V DC Return
	7	Not used
	8	Not used
	9	CI-B
	10	DO-B
	11	GND
	12	DI-B
	13	+12 V DC
	14	GND
	15	GND

Ethernet 10BASE-T and 10/100BASE-Tx Interfaces

The Ethernet 10BASE-T and 10/100BASE-Tx interfaces provide UTP support. Table C-4 identifies the pin locations and function assignments for these interfaces.

Table C-4. 10BASE-T and 10/100BASE-Tx Interface Pin Assignments

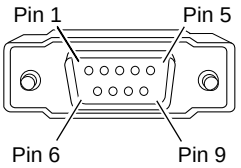
Pin Assignment	Pin No.	Signal (Function)
	1	TD+ (Transmit to UTP wire)
	2	TD- (Transmit to UTP wire)
	3	RD+ (Receive from UTP wire)
	4	Not used
	5	Not used
	6	RD- (Receive from UTP wire)
	7	Not used
	8	Not used

Token Ring STP Interface

The token ring STP interface provides shielded twisted-pair support. The ARN token ring base module, token ring expansion module, and token ring/tri-serial expansion modules contain this standard 802.5 DB-9 receptacle.

Table C-5 shows the pin assignments for the standard 9-pin STP receptacle on the ARN base or expansion module and identifies its pin locations.

Table C-5. Token Ring STP Interface Pin Assignments

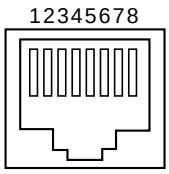
Pin Assignment	Pin No.	Signal Name
	1	RX+ (Receive from STP wire)
	2	GND
	3	GND
	4	GND
	5	TX+ (Transmit to STP wire)
	6	RX- (Receive from STP wire)
	7	GND
	8	GND
	9	TX- (Transmit to STP wire)

Token Ring UTP Interface

The token ring UTP interface provides unshielded twisted-pair support. The ARN token ring expansion module and token ring/tri-serial expansion modules contain this receptacle.

Table C-6 shows the RJ-45 pin assignments for the UTP interface and identifies the pin locations.

Table C-6. Token Ring UTP Interface Pin Assignments

Pin Assignment	Pin No.	Signal (Function)
	1	Not used
	2	Not used
	3	TX+ (Transmit to UTP wire)
	4	RX+ (Receive from UTP wire)
	5	RX- (Receive from UTP wire)
	6	TX- (Transmit to UTP wire)
	7	Not used
	8	Not used

Serial Interfaces

The ARN supports up to five serial interfaces. You can connect up to three, 44-pin (DB-44) serial cables to an ARN that contains an optional Ethernet/tri-serial, token ring/tri-serial, or tri-serial expansion module. You can connect one, 44-pin serial cable to each serial adapter module (the ARN can support two).

The serial interfaces provide multiprotocol WAN connection, each operating independently with RS-232, RS-422, RS-530, V.35, V.28, and X.21 electrical interfaces at transmission rates from 1200 b/s to 2.048 Mb/s. When used with standard keyed cables, the ports automatically configure to the desired electrical interface.

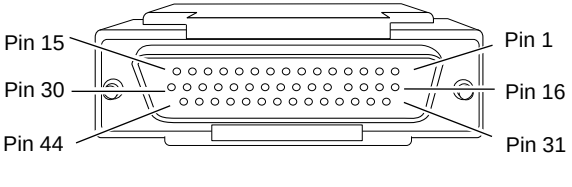
You can use the following cables, described in the *Cable Guide*:

- V.35 connections (Order No. 7220)
- V.28 connections (Order No. 7837)
- X.21 connection (Order No. 7224)

- RS-422 connections (Order No. 7318)
- RS-232 connections (Order No. 7826)
- RS-530 connections (Order No. AE0018012)

Table C-7 shows the signal and pin assignments for these connectors.

Table C-7. Serial Interface Pin Assignments

Pin Assignment	Pin No.	Signal Name	Pin No.	Signal Name
	1	FGND	23	DCD-
	2	SD+	24	ST-
	3	RD+	25	RT-
	4	RTS+	26	TT-
	5	CTS+	27	NC
	6	DSR+	28	RTIN#B
	7	SGND	29	CTSIN#
	8	DTR+	30	ST#
	9	DCD+	31	VST-
	10	ST+	32	VST+
	11	RT+	33	VRT-
	12	TT+	34	VRT+
	13	RTIN#	35	VRD-
	14	CTS#	36	VSD-
	15	RTS#	37	VRD+
	16	SD-	38	VSD+
	17	RD-	39	VTT-
	18	RTS-	40	VTT+
	19	CTS-	41	UNBE
	20	DSR-	42	V35D
	21	NC	43	GND
	22	DTR-	44	SNDC

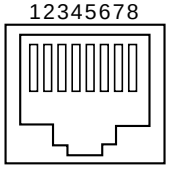
ISDN BRI U Interface

The ARN supports the BRI standard for ISDN using an optional ISDN/BRI adapter module. The integrated ISDN BRI functionality allows you to connect directly to the ISDN network, through a U interface, as opposed to connecting over a terminal adapter. This solution reduces equipment costs and simplifies connection to an ISDN switch.

The BRI implementation supports two dial service applications: dial-on-demand and dial backup. *Configuring Dial Services* describes these services and how to configure them for connection to an ISDN network.

Table C-8 lists the ISDN interface pin assignments.

Table C-8. ISDN BRI U Interface Pin Assignments

Pin Assignment	Pin No.	Signal
	1	Not used
	2	Not used
	3	Not used
	4	TIP
	5	RING
	6	No used
	7	Not used
	8	Not used

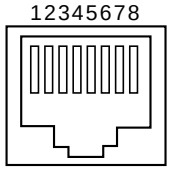
ISDN BRI S/T Interface

The ARN supports the BRI standard for ISDN using an optional ISDN/BRI adapter module. The integrated ISDN BRI functionality allows you to connect to the ISDN network over a terminal adapter through an S/T interface.

The BRI implementation supports two dial service applications: dial-on-demand and dial backup. *Configuring Dial Services* describes these services and how to configure them for connection to an ISDN network.

Table C-9 lists the ISDN interface pin assignments.

Table C-9. ISDN BRI S/T Interface Pin Assignments

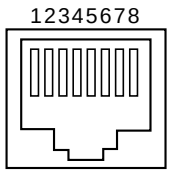
Pin Assignment	Pin No.	Signal
	1	Not used
	2	Not used
	3	Tx+ (Transmit to wire)
	4	Rx+ (Receive from wire)
	5	Rx- (Receive from wire)
	6	Tx- (Transmit to wire)
	7	Not used
	8	Not used

56/64K DSU/CSU Interface

The ARN supports direct synchronous access to either a 56K dataphone digital service (DDS) or 64K Clear Channel dedicated services using an optional 56/64K DSU/CSU adapter module. The 56/64K DSU/CSU interface uses an 8-pin RJ-45 connector as shown in Table C-10.

Table C-10 lists the 56/64K DSU/CSU interface pin assignments.

Table C-10. 56/64K DSU/CSU Interface Pin Assignments

Pin Assignment	Pin No.	Signal
	1	TD (Ring)
	2	TD (Tip)
	3	Not used
	4	Not used
	5	Not used
	6	Not used
	7	RD (Tip)
	8	RD (Ring)

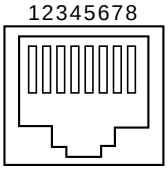
FT1/T1 DSU/CSU Connections

The ARN supports the conversion of data (HDLC protocol) from a T1 line using an optional FT1/T1 DSU/CSU adapter module. The integrated DSU/CSU functionality allows you to connect directly to the T1 network, as opposed to connecting via an external adapter. This solution reduces equipment costs and simplifies connection to a T1 carrier.

The ARN FT1/T1 DSU/CSU implementation supports dynamic reconfiguration, Fractional T1 loopback, Facility Data Link (FDL) functions, and an integrated Bit Error Rate Test (BERT) line tester. *Configuring WAN Line Services* describes these services and how to configure them for connection to a T1 network.

Table C-11 lists the ARN FT1/T1 DSU/CSU connector pinouts.

Table C-11. RJ-48C Connector Pinouts

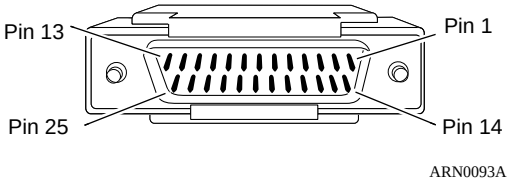
Pin Assignment	Pin No.	Signal
	1	Receive Data RING
	2	Receive Data TIP
	3	No Connect
	4	Send Data RING
	5	Send Data TIP
	6	No Connect
	7	No Connect
	8	No Connect

X.25 PAD Connections

The ARN provides X.25 PAD functions that enable the router to access X.25 services through the 8 ports of an attached breakout box. The PAD establishes and maintains links with the packet switch network, assembles and disassembles packets, communicates with the character terminal, and handles special control processes for the character terminal.

You connect the X.25 ports using an RS-232-D serial connection as shown in Table C-12.

Table C-12. X.25 Breakout Box Interface Pin Assignments

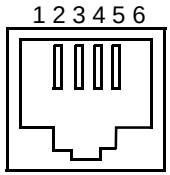
Pin Assignment	Pin No.	Signal (Function)	Pin No.	Signal (Function)
	1	GND	13	Not Used
	2	RxD	14	Not Used
	3	TxD	15	Not Used
	4	RTS	16	Not Used
	5	CTS	17	Not Used
	6	DSR	18	Not Used
	7	GND	19	Not Used
	8	DCD	20	DTR
	9	Not Used	21	Not Used
	10	Not Used	22	Not Used
	11	Not Used	23	Not Used
	12	Not Used	24	Not Used
			25	Not Used

RJ-11 Interface (for V.34 Modem)

The ARN supports a V.34 modem connection using an optional V.34 modem adapter module. The V.34 functionality allows you to connect directly to a phone line, as opposed to connecting over an external modem. This solution reduces equipment costs and simplifies connection to a wide area network.

Table C-13 lists the V.34 interface pin assignments.

Table C-13. V.34 Interface Pin Assignments

Pin Assignment	Pin No.	Signal
	1	Not Used
	2	No Connection
	3	TIP
	4	RING
	5	No Connection
	6	Not Used

Local Console Connections

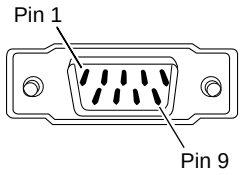
The ARN back panel contains one console service interface, labeled Console; its DB-9 plug connector provides an RS-232-D serial connection. You use this local console port to connect the ARN to a PC or VT100 compatible console device for direct console access.

The BayStack ARN shipping package includes the console/modem kit (Order No.110310) for connecting devices to the Console port.

- To connect a terminal to the Console port, use the complete console/modem kit, including the cable (Order No.110307) with the null modem adapter (Order No.110308).
- To connect a PC running Windows NT to the Console port, use the complete console/modem kit, including the cable (Order No.110308) and the null modem adapter (Order No.110307) plus a standard AT serial cable with one DB-25 plug connector, supplied with the PC.

The connector pin assignment described in Table C-14 shows signal and pin assignments for the Console port.

Table C-14. Local Console Port DB-9 Pin Assignments

Pin Assignment	Pin No.	Signal Name	Direction
	1	Not used	N/A
	2	TXD (Transmit data)	To terminal
	3	RXD (Receive data)	From terminal
	4	Not Used	N/A
	5	Ground	N/A
	6	DTR	To terminal
	7	Not Used	N/A
	8	Not Used	N/A
	9	Not Used	N/A

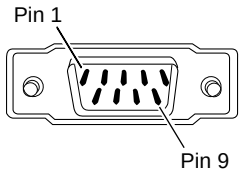
Service Modem Connections

The ARN back panel contains one modem service interface, labeled Modem; its DB-9 plug connector provides an RS-232-D serial connection. You use this local console port to connect the ARN to any Hayes compatible modem for remote dial-in access.

The BayStack ARN shipping package includes the console/modem kit (Order No.110310) for connecting devices to the Modem port. To connect a modem, use the cable (Order No.110307 from the kit), a standard, 15-foot molded AT serial cable with DB-9 receptacle to DB-25 plug connectors.

The connector pin assignment described in Table C-15 shows signal and pin assignments for the modem port.

Table C-15. Service Modem Port DB-9 Pin Assignments

Pin Assignment	Pin No.	Signal Name	Direction
	1	DCD (Data carrier detect)	From modem
	2	TXD (Transmit data)	To modem
	3	RXD (Receive data)	From modem
	4	DSR (Data set ready)	From modem
	5	GND	N/A
	6	DTR (Data terminal ready)	To modem
	7	CTS (Clear to send)	From modem
	8	RTS (Request to send)	To modem
	9	Not used	N/A

Appendix D
Requirements for European Operation

This appendix provides information required for operating the ARN in Europe, cabling requirements for synchronous (serial) connection, and information about using the serial adapter module (Order No. CV0004001) and ISDN BRI adapter module (Order No. CV0004002) in Europe.

ARN Ethernet Base Model Safety Status

Table D-1 lists the safety status of interconnection points to the connection of other equipment.

Table D-1. Safety Status (Order Nos. CV1001001, CV1001002, CV1001003, CV1001004, CV1001005)

Port Location	Port Description	Type of Circuit
AUI	Ethernet AUI	Safety extra-low voltage (SELV)
UTP	Ethernet 10BASE-T	SELV
Console	V.28	SELV

ARN Token Ring Base Model Safety Status

Table D-2 lists the safety status of interconnection points to the connection of other equipment.

Table D-2. Safety Status (Order Nos. CV1101001, CV1101002, CV1101003, CV1101004, CV1101005)

Port Location	Port Description	Type of Circuit
MAU	Token Ring	SELV
Console	V.28	SELV

ARN Expansion Modules Safety Status

ARN expansion modules are upgrade options that provide an additional synchronous interface. These options can be installed in any ARN model.

Table D-3 lists the safety status of the interconnection point (COM3, COM4, COM5) provided by each of the expansion modules (Order Nos. CV0004011, CV0004012, CV0004013, CV0004014, CV0004015) to the connection of other equipment.

Table D-3. Safety Status (Order Nos. CV0004011, CV0004012, CV0004013, CV0004014, CV0004015)

Port Location	Port Description	Type of Circuit
COM3, COM4, and COM5	V.28, X.21, V.35	Telecommunications network voltage (TNV) at SELV levels
AUI	Ethernet AUI	SELV
10Base-T	Ethernet 10BASE-T	SELV
MAU	Token Ring	SELV
J2	Host Port	SELV

Synchronous Cabling Requirements

Refer to Figures D-1 through D-3 and Tables D-4 through D-6 for serial interface cabling information.

Note the following compliance requirements:

- V.28 compliance requires an Order No. 7837 cable.
- V.35 compliance requires an Order No. 7220 cable.
- X.21 compliance requires an Order No. 7224 cable.

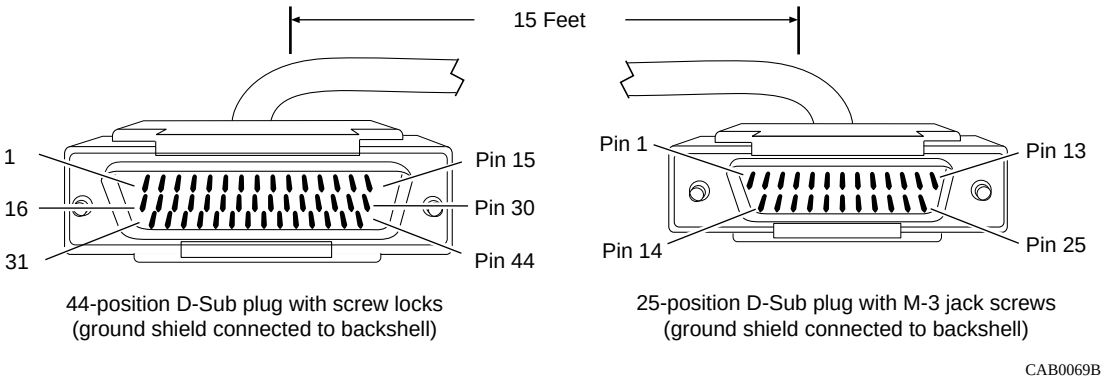


Figure D-1. Cable 7837 (V.28 Compliant)

Table D-4. WAN Interface (Order No. 7837)

Bay Networks Termination		Remote Termination	
Pin	**Signal**	**Pin**	**Signal**
1	Frame Ground	1	Frame Ground
2	Send Data+	2	Send Data
3	Receive Data+	3	Receive Data
4	Request to Send+	4	Request to Send
5	Clear to Send+	5	Clear to Send

(continued)

Table D-4. WAN Interface (Order No. 7837) *(continued)*

Bay Networks Termination		**Remote Termination**	
6	Data Set Ready+	6	Data Set Ready
8	Data Terminal Ready+	20	Data Terminal Ready
9	Data Carrier Detect+	8	Data Carrier Detect
10	Send Timing+	15	Send Timing
11	Receive Timing+	17	Receive Timing
12	Transmitter Signal Element Timing+	24	Transmitter Signal Element Timing
7	Signal Ground	7	Signal Ground
Local Wire Connections			
Pin 7 > 19 > 20 > 23			
Pin 13 > 28			
Pin 14 > 29			

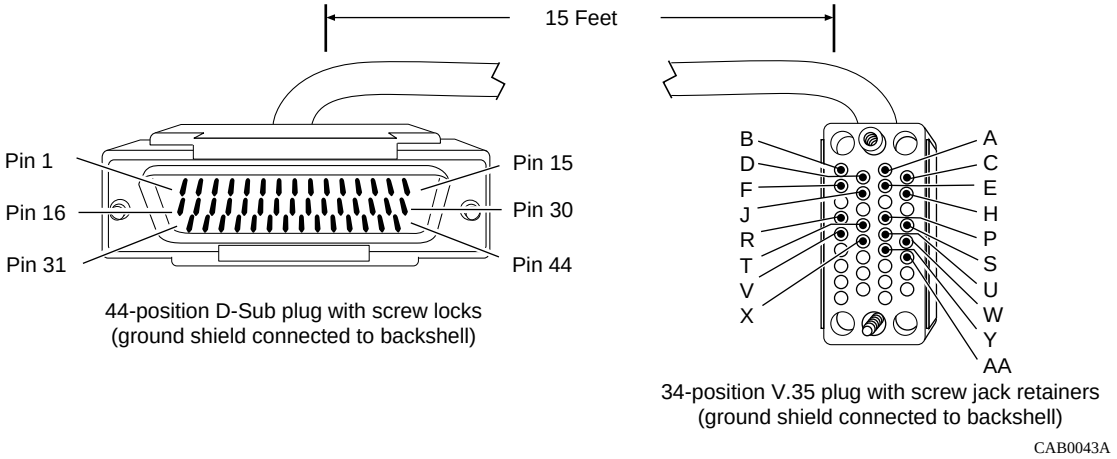


Figure D-2. Cable 7220 (V.35 Compliant)

Table D-5. V.35 Interface (Order No. 7220)

Bay Networks Termination		**Remote Termination**	
Pin	**Signal**	**Pin**	**Signal**
38	VSD+	P	Send Data A
36	VSD-	S	Send Data B
34	VRT+	V	Receive Timing A
33	VRT-	X	Receive Timing B
32	VST+	Y	Send Timing A
31	VST-	AA	Send Timing B
37	VRD+	R	Receive Data A
35	VRD-	T	Receive Data B
6	Data Set Ready+	E	Data Set Ready
8	Data Terminal Ready+	H	Data Terminal Ready
4	Request to Send+	C	Request to Send
5	Clear to Send+	D	Clear to Send
40	VTT+	U	Terminal Timing A
39	VTT-	W	Terminal Timing B
1	Frame Ground	A	Frame Ground
9	Data Carrier Detect+	F	Data Carrier Detect
19	Signal Ground	B	Signal Ground
Local Wire Connections			
Pin 19 > 20 > 23 > 7			
Pin 41 > 42 > 43			
Pin 13 > 28			
Pin 14 > 29			

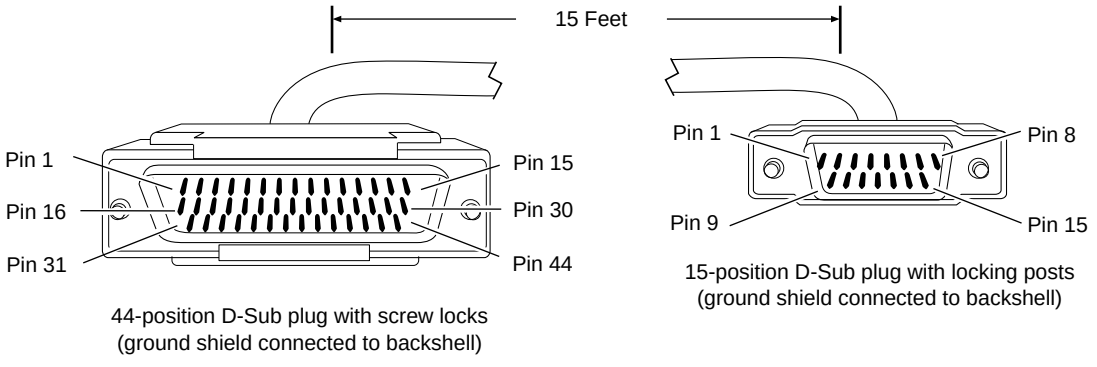


Figure D-3. Cable 7224 (X.21 Compliant)

Table D-6. X.21 Interface (Order No. 7224)

Bay Networks Termination		**Remote Termination**	
Pin	**Signal**	**Pin**	**Signal**
2	Send Data+	2	TD A
16	Send Data-	9	TD B
4	Request to Send+	3	Control A
18	Request to Send-	10	Control B
3	Receive Data+	4	RD A
17	Receive Data-	11	RD B
9	Data Carrier Detect+	5	Indication A
23	Data Carrier Detect-	12	Indication B
10	Send Timing+	6	Timing A
24	Send Timing-	13	Timing B
7	Signal Ground	8	Signal Ground
1	Frame Ground	1	Frame Ground
Local Wire Connections			
Pin 41 > 43			
Pin 28 > 30			
Pin 14 > 15			

Serial Adapter Module Requirements

The serial adapter module (Order No. CV0004001) is approved only for installation in a host, and with host attachments, which are either type approved for such apparatus or, if supplied after 1st March 1989, are marked with or supplied with a statement that the host is supplied under the terms of General Approval Number NS/G/1234/J/100003.

Installation of the serial adapter module in any BayStack ARN chassis (Order Nos. CV1001001, CV1001002, CV1001003, CV1001004, CV1001005, CV1101001, CV1101002, CV1101003, CV1101004, CV1101005) complies with all requirements listed in this section. Installation of the serial adapter upgrade module in any ARN complies with all requirements listed in this section.

Table D-7 lists the safety status of interconnection points to the connection of other equipment.

Table D-7. Safety Status (Order No. CV0004001)

Port Location	Port Description	Type of Circuit
COM	V.28, X.21, V.35	TNV at SELV levels
P6	Host port	SELV

ISDN BRI Adapter Module Requirements

The ISDN BRI adapter module (Order No. CV0004002) is approved only for installation in a host, and with host attachments, which are either type approved for such apparatus or, if supplied after 1st March 1989, are marked with or supplied with a statement that the host is supplied under the terms of BABT General Approval Number NS/G/1234/J/100003.

Installation of the ISDN BRI module in any BayStack ARN chassis (Order Nos. CV1001001, CV1001002, CV1001003, CV1001004, CV1001005, CV1101001, CV1101002, CV1101003, CV1101004, CV1101005) complies with all requirements listed in this section. Installation of the ISDN BRI upgrade module in any ARN complies with all requirements listed in this section.

Table D-8 lists the safety status of interconnection points to the connection of other equipment.

Table D-8. ISDN BRI Safety Status (Order No. CV0004002)

Port Location	Port Description	Type of Circuit
ISDN	BRI ISDN	TNV at SELV levels
P6	Host Port	SELV

Table D-9 lists the ISDN connector pinouts.

Table D-9. ISDN Connector Pinouts

Pin	Signal
1	No connection
2	No connection
3	Tx+
4	Rx+
5	Tx-
6	Rx-
7	No connection
8	No connection

Power Requirements for ISDN BRI and Serial Adapter Modules

The ISDN BRI and serial adapter modules obtain power from the host chassis and have the power requirements shown in Table D-10.

Table D-10. ISDN BRI Power Requirements

Voltage	Amperage
+5 V	1 A
+12 V	0.15 A
-12 V	0.15 A

The power drawn from the host chassis combined with that required for any other cards and accessories must be within the power rating of the host chassis.

When you install an ISDN BRI or serial adapter module in an ARN, make sure that you do not impair the integrity of the network protection from hazardous voltages used or generated internally by the host chassis.

Clearance and Creepage Distances for ISDN BRI and Serial Adapter Modules

The clearance and creepage distances (shown as X and Y, respectively, in Figure D-4 and Table D-11) must be maintained between the card and:

- The host chassis in which it is installed
- Any adjacent cards installed in the host chassis

The exception to this rule is the edge connector, which resides in the host chassis backplane, where no minimum distance applies.

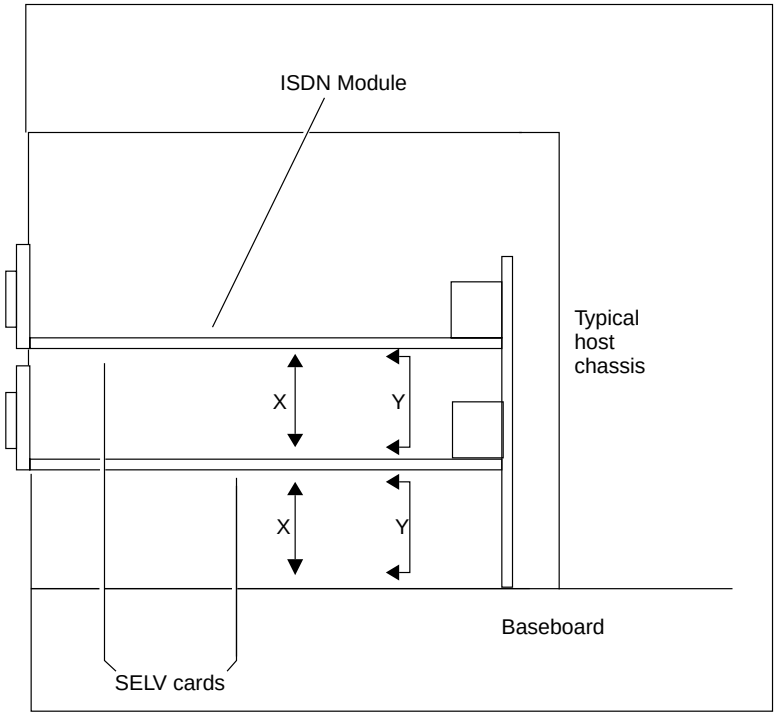


Figure D-4. Clearance and Creepage Distances for ISDN BRI and Serial Adapter Modules

Table D-11. Clearance and Creepage Distances for ISDN BRI and Serial Adapter Modules

Clearance (X)	Creepage (Y)	Voltage used or generated by other parts of the host or expansion card
2.0 mm	2.4 (3.8) mm	Up to 50 V RMS or V DC
2.6 mm	3.0 (4.8) mm	Up to 125 V RMS or V DC
4.0 mm	5.0 (8.0) mm	Up to 250 V RMS or V DC
4.0 mm	6.4 (10.0) mm	Up to 300 V RMS or V DC

The creepage distances apply to the normal office environment. When the local environment within the host chassis is subject to conductive pollution or dry nonconductive pollution that could become conductive due to condensation, the creepage distances shown in parentheses in Table D-11 apply.

The clearance and creepage distance between adjacent points should be checked as follows:

- The clearance distance (X) is the shortest distance between two points measured through the air.
- The creepage distance (Y) is the shortest distance between two points measured across a surface.

If in doubt about calculating these distances, obtain advice from a competent telecommunications safety engineer. Failure to install the ISDN BRI or serial adapter module according to these instructions invalidates the conditions of the BABT General Approval agreement.

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